Rock Products

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Foreword

YOU will find between the covers of this issue the most comprehensive and exhaustive discussion of every phase of the quarry and gravel industries ever assembled. These papers and discussions are by the top-notch men of these and allied industries and professions.

If the recipient of this issue of ROCK PRODUCTS is disconcerted by its bulk, he will nevertheless do well to examine it with care, and then to give it a handy place on his desk or bookshelf for ready reference. It is hardly to be expected he will read it through at one sitting.

Yet the editors who have of necessity read and reread the whole of the contents assure you in all sincerity that their respect for it has increased the more familiar with it that they have become.

Surely no producer can read this volume without having a profound respect for the two National Associations which are responsible for the conventions at St. Louis in January, where these papers were read and discussed. These conventions have truly become National Institutes for the education of business men engaged in these two great basic industries.

And while this cold record in black and white may serve to make many readers better informed in regard to their industries, it does not adequately compensate those who were so unfortunate as to have missed the conventions, for the loss of those personal contacts with other producers, the friendships made, the confidences exchanged, the broadened outlook and the goodfellowship attendant to those national gatherings of the clan.

The editors have gone to considerable pains and much labor to thoroughly index the subject matter in this volume, so that a reader may readily refer to any problem of practice, precedent, operating problem, etc., that he may at some future time be compelled to face. And again the editors assure you that you will find a wealth of material of very practical value to you in your business, if you will make use of this volume for the purpose intended.

Edmund Shaw.

Nathan C. Rockwood

—The Editors.

Transactions of the Seventh Annual Convention of the National Crushed Stone Association

THE seventh annual convention of the National Crushed Stone Association (founded at Columbus, Ohio, January 1918) was convened at the Hotel Statler, St. Louis, Mo., January 21, 1924, F. W. Schmidt, president of the association, presiding. Chairman Schmidt first introduced the acting mayor of St. Louis (the president of the Board of Aldermen).

Address of the Acting Mayor of St. Louis

HON. WALTER J. G. NEUN: Mr. President and Gentlemen: As acting mayor of the city of St. Louis, I come up here with the express purpose of giving you a welcome to the city of St. Louis.

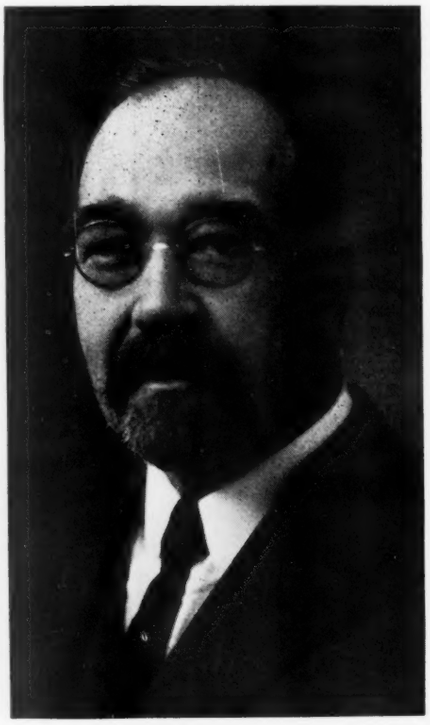
It is pretty cold outside this morning, and I know that we have to warm things up by the warmth of our meeting, and that is the reason I want you gentlemen, coming from all parts of the United States, I take it, to feel right at home in St. Louis, because we are a warm people.

We want you to enjoy yourselves; we want to give you the freedom of the city; we want you to know that you are welcome, and we want you to know that we are glad you are here with us today.

Now, I am going to tell you a few things about St. Louis. I do not say this in a boastful way, but I merely want you to know a few facts about this city. You know about a year ago St. Louis passed an $87,000,000 bond issue. St. Louis has already been on the map, and we are going to put it on the map for keeps.

We are going to build a great big memorial plaza on Twelfth street. We are going to erect buildings costing millions of dollars; we are going to widen our streets, increase our sewer system, and, in general, put on a wonderful campaign of improvement. Many of the cities of this country are writing to us asking us about the details of this wonderful project, and I know that you are also interested in that.

I had occasion the other day to be invited to a great big power plant that we also claim here in St. Louis. It is called "Cohekia." You have read in the papers about Muscle Shoals, and I am sure you have, in your imagination, wondered of the great power that Muscle Shoals would generate. Right here in St. Louis, when our plant is completed (one-third of it is already completed and the rest is under way), it will be three times as great as Muscle Shoals. In other words, the electrical power supplied by that plant will be able to take care of the entire city of St. Louis, all its electrical facilities, and will be the largest power plant in the country. They have machines costing as much as $500,000 each. I am only telling you about this because I just learned about it in detail a few days ago. It impressed me very much. I think it is a wonderful thing for the city and humanity in general. They feed their boilers with pulverized coal. We had the pleasure the other day of attending a banquet, composed of about 30 people, in one of their boilers. Think of it, holding a banquet in one of their boilers! The thing is so large that it is appalling, and if any of you gentlemen would have the time it would pay you to make a visit to that plant.



F. W. Schmidt, President of the National Crushed Stone Association 1923; Chairman 1924 Convention

We have a wonderful system of boulevards here. We are known for our residences; but, of course, on a day like this I do not know whether you would care to make a tour of our city to look at them, but if you do you will be amply repaid for the time spent.

I want to say again that I am glad you are here. I want to issue to you the official welcome of the city of St. Louis, and if there is anything that the city fathers can do to make your stay more convenient and more pleasant, I trust you will not hesitate to call upon us. I thank you.

PRESIDENT SCHMIDT: On behalf of the National Crushed Stone Association and its friends here assembled, I wish to thank his honor, the acting mayor of this great city, for the kindly welcome he has extended to our association and its friends.

Since our last annual meeting we have generally passed through a busy season. Car service and railroad conditions were much better than in 1922.

As you all know, the recommendations of my predecessor, President W. Scott Eames, on membership were adopted and the number of our members has greatly increased, and I am confident in saying that they are better pleased. We undoubtedly have the largest producers among our membership, still there are many others who should join, and I hope that every producer here who is not now a member will sign up before he leaves St. Louis, and I further wish that all members would make it a point to secure at least one new member during 1924. This we owe to our membership committee, which deserves the thanks of the association for the work it has been doing, and we hope this good work will be continued.

Your immigration committee appeared before both the House and Senate committees of our last Congress, and, I believe, left with them the viewpoint of this industry on immigration. This committee should be continued as the indications are that immigration of the class we mostly need will be further restricted; in fact, the House Committee Bill calls for only 2% based on the census of foreign born residents in 1890, whereas the present law permits 3% based on 1910 census. I believe the present law will better serve our industry than the proposed act. In any case, selection should be made on the other side so as to avoid the many hardships that have developed.

Our railroad committee made protest to the Interstate Commerce Commission against the apparent difference in demurrage rules between handling coal and our products. Both industries use the same class of equipment, and to our minds, we should be treated alike as to demurrage charges. Custom, however, seems to have built up a method for coal that will be hard to upset, but I believe we should keep after the carriers until that point is cleared up.

This committee also appeared before the Interstate Commerce Commission and asked leave to intervene in the slag case, Docket No. 15216, etc., and presented reasons why slag should not have lower freight rates than stone. This case is still pending and the railroad committee should be continued and requested to see that no

commodity of this kind receives any better consideration than crushed stone.

This is the first meeting in which the manufacturers' division will participate. They have gone to considerable trouble and expense in preparing exhibits, and some time from each session will be set aside so that all will be able to see the exhibits and discuss them with the representatives of our associate members.

The stone industry has become so large that it seems high time that a name should mean the same thing in designating our product, and I hope a committee is appointed to work with the proper authorities to standardize the size of stone and names of the same.

I trust that our committee on uniform cost accounting will have a plan to offer that can be adopted at least in principle by all. This is a matter for serious consideration. Proper knowledge will save many a heartache when the balance sheet shows a shortage due to things overlooked, forgotten, or unknown.

Our program is varied and I am sure it will be enjoyed and prove profitable to all. We propose to devote part of each session to open discussion on various subjects with which we are all more or less familiar, and I hope these discussions will bring light to those who desire it. Let all be free to take part.

Summary of the Reports of Directors of the National Crushed Stone Association on Conditions in Their Respective Localities

FOR the convenience of the reader and under the instructions of the association executive committee the reports of the 23 officers and directors of the National Crushed Stone Association on conditions in the industry in their respective localities have been digested and summarized by the editor under the following headings: Production; Demand, Etc.; Relations with the Railways; Labor Situation; Outlook for 1924.

Production

Practically every director reported greater demand and production in 1923 than in 1922, or any previous year in the history of the industry. Some directors stated with perfect frankness and simplicity that they had been unable to supply the demand during the summer months—which did not mean that they could not have supplied the demand if it had been more uniformly distributed throughout the year. No one stated that the demand was beyond the capacities of their plants on such a basis.

The demand, generally speaking, was good in all branches of the trade—railway ballast, highway stone, building material. The ballast demand was slack in New England and western New York; elsewhere it was good. In the Central West (Ohio more particularly) ballast orders were about the same as during the last three years, but the orders were placed later than usual; this helped to crowd the peak load on the plants into three or four summer months, with the result that specifications for shipments of ballast were in many instances considerably short of orders placed; or, in other words, of anticipated demand.

The big demand, the lateness in the season of starting, the rush to get early orders, etc., adversely affected both producer and consumer.

Service costs the quarryman good money by reason of the necessary additional storage and plant facilities required. Contractors and railway purchasers frequently lose sight of this entirely when they ask and expect the producer to meet the price of the other fellow who gives the material when he has it, but goes to no expense to take care of anything other than his daily output.

Relations with Railways

Generally speaking, the old-time cordial relations between quarry operators and railway officials are being re-established on a firmer basis and with more understanding than ever before. In many instances producers have succeeded in inducing the railway officials to grant rate reductions to the mutual advantage of both producer and railways. The crushed-stone business is growing in influence and is acquiring a decidedly more respectful consideration from the railways, both from the standpoint of maintenance-of-way and traffic officials. This is due to the larger and more substantial units of production, which have been evolved in the last 10 or 15 years. These are able to furnish a larger and more dependable supply of ballast, and the great growth of highway construction has naturally increased the volume of stone traffic moving over the railways, which impresses the traffic departments. Also should be mentioned the increasing confidence of crushed-stone producers in themselves and in the basic nature of their industry.

In the East, however, the heavy movement of stone last season, and the imperative demand of highway departments and contractors to complete large commitments in a short time, caused large tonnages to move long distances on what are, in reality, relatively high freight rates; these movements have sometimes resulted in giving railway traffic departments a false estimate of the level of rates that stone traffic can bear under normal conditions. It is believed, however, that where railway traffic officials are at present disinclined to co-operate in rate reductions, they are susceptible of being convinced as time goes on, and the dependability of this traffic is more clearly demonstrated.

In the matter of car service and avoidance of car shortages, every director had some word of praise for the railway managements. The explanation of this extraordinary transportation service after the experiences of 1920 and 1922 was laid to one of three things: The railways had more cars for this service; they handled them more efficiently and with better judgment; or they recognized the stone business as more deserving of attention than heretofore. Perhaps the truth is that all three of these elements are responsible.

The general sentiment of the majority of directors is summed up in the following: The railways must be given an opportunity to get on a sound financial footing. For that reason it behooves, not only the crushed stone industry, but every industry to approach with caution the matter of reduced freight rates. The managers of railroad properties are all of the opinion that the lower the freight rate the greater will be the tonnage moved. It is, however, absolutely necessary in the interest of both shippers and carriers that the transportation companies earn enough to enable them to continue to give satisfactory service and prepare for the increasing demands made upon them. In approaching traffic officials for adjustment in freight rates, reductions should be requested only in cases where absolutely necessary to enable one to hold business.

The Public Service Commission of Missouri has forced the railways of that state to publish a rate for intrastate traffic "that is certainly a very cheap rate for crushed stone and gravel." Car service in this locality was the best ever known. Practically all the railways have purchased new equipment in large quantities, and have put their old equipment in repair. The demand for ballast is good, and the railways are paying prices that give the producers small margins of profit. In

Ohio, likewise, a reduction in freight rates on stone and gravel was forced upon the railways by the state public utilities commission—with equally agreeable results.

Labor

There was no general shortage of quarry labor in 1923. In the East wages ranged from 30 to 60 cents per hour, but there seems to have been no holdup for excessive rates through the medium of strikes or difficulties of that nature. There was nowhere a shortage of skilled labor. The efficiency of labor was generally considerably above that of previous years. Except in the most eastern states there was little immigrant labor in evidence. Immigrants may come in through "bootleg" channels in spite of present restrictions. In the East there is an almost unanimous belief that immigration laws should be revised to permit a greater influx of European labor, about equally divided in opinion between the northern and southern countries of Europe.

In the South the migration of negroes to northern jobs is not looked upon as a necessary evil by broadminded employers. While this migration has caused temporary shortages of labor, at least one representative quarryman has been able to get along comfortably well. He looks upon his negro laborers as human beings, giving them comfortable living quarters, garden plots, etc. He does not feel that the movement of the negro North has hurt the South, but that it will eventually bring about better wages, better living conditions and more efficiency in Southern agriculture and manufacturing, as well as in every other line of industry.

In the Central West quarrymen are generally satisfied with present labor conditions in spite of advanced wages. Labor in this section in 1923 was just about sufficient to keep plants going. Had it not been for greater efficiency on the part of labor a serious condition might have arisen. There was no surplus of labor, and had employers started bidding for labor in competition with employers of short-time labor, a run-away labor market might have been created. The remedy as seen by these operators is not more immigration but maintenance of present efficiency and the introduction of all possible labor-saving devices.

In many portions of the Central West sentiment is strong against any lessening of immigration restrictions—even in sections where considerable shortages of labor were experienced in 1923. While both mines and quarries are short handed on many occasions the general opinion among enlightened operators is against an increase in immigration. There is a large foreign element in most of the northwestern states which is not as yet very well assimilated and the political activities of this element do not incline men of affairs who try to live up to the spirit of American institutions to add to their burdens. Reduction of the wheat acreage of the Northwest, as proposed for 1924, will help relieve present labor shortages.

Common labor is plentiful at fair wages in California. Immigration does not affect the labor situation there, as it does in the East. Plants are operated the year 'round with permanent crews. Common labor is $3.50 to $4 per 8-hr. day. The men are paid every two weeks as required by law.

Outlook for Present Season

Prospects for 1924 looked good to producers from every part of the country. No clouds appear on the horizon and with reasonable conservatism in prices, should big demands arise, the demand will not be choked by cupidity and good times seem ahead of the industry. The contemplated program for road building is enormous. The automobile industry still expands. More cars mean more roads. The railways are generally prosperous and anxious to improve their facilities. General building looks good. In the South several big bond issues for road work will be available for the first time. However, with new plants opening up it is doubtful if 1923 will be any more profitable to the producers as a whole.

In spite of the fact that a part of bond issue money finds its way into the treasury of quarry companies some broadminded directors are of the opinion that mounting taxes are a real menace to national prosperity.

Coal and Crushed Stone

By P. H. Greenlaw

In Charge of Statistics, Coal Operators' Association, Fifth and Ninth Districts of Illinois, St. Louis, Mo.

I WILL try to talk to you as one man to another. In what I say I shall try to impress you with some phases of the coal industry. The matters touched are of equal importance to other industries.

P. H. Greenlaw

I shall stress the necessity of equal obligation under the law for all organizations of men of whatever class, who have it in their power to influence public welfare.

I shall try to show that miners are receiving a high wage for the time employed; that reductions rather than increases should be in order; that from their wage their organizations accumulate vast sums of money —*material*—which is used to influence things and people other than their membership.

I shall not argue against union organization, for I believe in the right of workmen to organize, but I shall suggest a line of procedure which is different than usually results from a conference of union representatives.

Conditions in England will be mentioned because things that are transpiring there are in line with what we term radical views here, and because the United Mine Workers of America will, within the next two weeks, give evidence of their good faith or lack of good faith in their gesture against radicalism within their own ranks.

Minorities will be mentioned because in many instances these days active minorities are enforcing their will upon inactive majorities.

I ask you to actively support conservative governmental procedure—to try to understand motives and bring harmony out of the "jazz" that fills the air.

Any given set of men is but one instrument in the "band" that must continue to play "America" and they must not only get on the right "key," but must influence others to do so.

It is hard for everybody to see things in the same way. Even "America" does not sound the same to everybody.

Is it any wonder that we sometimes fail to understand each other's point of view on matters upon which it would seem obvious that we should all agree?

Our mutual friend Mr. Rockwood gave me only a small order for delivery today. He said you would be interested:

First—To hear about coal production and wages.

Second—Whether there will be a strike this spring.

Third—Whether the price of coal will in-

crease or decrease.

Fourth—Whether cars will be plentiful or scarce.

Fifth—About how your own markets are going to be and if you will have cars to care for your own business.

I can answer all of these inquiries which deal with the future quickly and concisely. Nobody knows definitely.

Having disposed of so much I will tell you a few facts about coal production and wages, and ask your indulgence for a few moments to tell you why we do not know more definitely some of what the future holds in store.

Coal production in 1923 was about 545,000,000 tons (bituminous).

It has been exceeded in but two or possibly three years—1918-1920 and probably 1917. (579,000,000, 569,000,000 and 552,000,000 tons respectively.) It is possible that with the revised figures 1923 will exceed 1917 production.

Bargain prices have prevailed because plentiful car supply has resulted in a buyers' market. Wise men have stored some coal.

Now as to earnings of workmen. A study of earnings in the years 1920, 1921 and 1922 in Illinois shows the following:

1920—70,918 men; averaged 130 days; earned average $1040.30. Of these there were who worked 51% or over of the time the mines worked *35,545 men; averaged 215 days; earned average $1730.16. Showing that 50% of the men earned 83½% of the money.*

1921—86,225 men; averaged 100 days; earned average $858.08 Of these there were who worked 51% or over of the time the mines worked *47,681 men; averaged 155 days; earned average $1340.15—55% of the men earned 86% of the money.*

1922—86,078 men; averaged 88 days; earned average $731.46. Of these there were who worked 51% or over of the time the mines worked *53,326 men; averaged 124 days; earned average $1032.04—62% of the men earning 87% of the money.*

Strike five months.

Organizations of workmen deal with human beings while organizations of employers deal with "material things," Mr. Gompers claims. He gives this as a reason why workmen's organizations should not be amenable to law.

Yet in those three years, by means of the "check-off" the miners organization collected from its members in Illinois approximately $3,719,887, $4,415,263 and $4,361,061 respectively, a total of $12,496,211 for the three years in this one state. This was equal to 4.2 cents, 6.4 cents and 7.4 cents respectively per ton of coal produced, or 2.46%, 3.33% and 4.06% respectively of the total payroll disbursements.

Strikes are financed through the "check-off."

The chances are that there will be no strike this spring. But strikes are legal. That has been decided many times.

It is provided by statute that business men may not agree, or combine, to restrict production or to interfere with interstate commerce. Intra-state commerce is also similarly protected.

Business men, as you know, cannot agree as to prices that they will charge for their product—whether the agreed price be high or low, reasonable or unreasonable, in public interest or against public interest.

That might tend to create a monopoly, it is thought, and monopolies are frowned on.

But the law allows strikes. And the law allows agreements and combinations among workers in industry. And it provides that workers in an industry, or in more than one industry, may combine and agree for the purpose of shortening the hours of labor, increasing their wage or bettering conditions of employment.

That is a large range of privilege. It forms the basis of the creation of monopoly.

It has worked out in the coal industry that way. Coal labor is monopolized in union territory.

And through the application of the "right to strike," which is supported in several states by legal injunction against the employment of men who fail to secure certification by boards selected from the membership of the union, the state steps in and protects the sanctity of the ownership of the vacant job to the man who has vacated it until such time as he may determine to return to work in it.

Looking back at 1922, can you recall anything in particular that was done to protect the sanctity of the right of the individual to work in safety during the period of suspension?

I am not here criticising that situation—but the coal operator should not be unduly criticised for his failure to operate his mine during a period of suspension.

The operator in general recognizes his responsibilities. "He will stand." No special brand of government regulation is necessary for him. He needs the same governmental supervision that is necessary to all to insure justice, tranquility and fair play.

But why exempt the other half of the team? Why not give that same brand of supervision to, and demand that same sense of responsibility of, the other half of the team?

As things now stand it matters not whether a strike be called for justifiable cause or without justifiable cause—whether it is sought to increase wages that are unreasonably low, or to increase wages that are already unreasonably high.

Nor whether it is called to shorten hours of labor that are unbearably long—or to shorten hours of labor that have already been shortened out of proportion to the hours worked by fellow laborers in other lines of industry—those questions do not matter.

And the laws that are now on the books purporting to protect the public from a creation of a monopoly which it is feared might restrict the supply of the necessaries of life, or increase the price of the same to the public, sanction the creation and protect the existence of this monopoly which actually does and has restricted the supply, directly and indirectly, of all of the necessaries and all of the luxuries of life and increased the prices of all.

Here we have a sample of governmental regulation of industry. It is now effective. It will probably not be modified by Congress, although the attention of Congress has been called to it by no less person than the late President Harding, who stated to Congress, "The simple but significant truth was revealed that except for such coal as comes from the districts worked by non-organized miners the country is at the mercy of the United Mine Workers."

And by no less a body than the U. S. Coal Commission, who in their report stated, "Widespread strikes and lack of railroad transportation to carry the peak load in times of extreme demand are the two factors that alone are responsible for the serious shortage of bituminous coal in this country that have several times occurred since 1915."

President Coolidge has sensed the situation. Recognizing the over-development and over-manning of the industry with resultant ruinous competition, he said to Congress in his recent message, "By amending the car rules, by encouraging greater unity of ownership and, possibly, by permitting common selling agents for limited districts on condition that they accept adequate regulations.

Your business is a growing business. One hundred years ago I believe portland cement was invented. One hundred years ago you would have had difficulty in marketing crushed stone either for steel making or for fertilizing. One hundred years ago the center of population lay far East and total population was small. Few roads were needed and none built such as are being laid so extensively today.

The adjustment of foreign markets and the buying power of foreign countries, important as it is, is not nearly so important as a business proposition as the upbuilding of American population and citizenship.

Business will be good in 1924. It may be rushing. But the chances are that it will just be good. It will be up to you and each of you to determine how good it is for each by working and planning to get your share under conditions of competition, and on a basis that will justify the operation of your plants.

There will be no "royal road" to business in general this year. It will more than likely be beset with more than usual difficulties. *But to the efficient, live, individual or business organization—whether of management or of employes—which is in position to adjust costs and charges to meet competition—Business will be good.*

Cost-Keeping, Labor Handling and Administration of a Moderate-Sized Quarry Plant

By R. N. Van Winkle

General Manager, Hawkeye Quarries Co.,
Cedar Rapids, Iowa

PERSONALLY, I am a firm advocate of moderate-sized crushing plants and though I have operated big units for other people, when the time came to blossom out in the stone business for myself I looked for moderate-sized plants and considered nothing else. In the particular state in which I chose to make my debut as a quarry owner and operator, crushed stone, and in fact all quarry products are carried by the railroads and electric lines on strictly a mileage basis, so the large plant which must of necessity supply a large area to obtain a market for all its product is at a disadvantage owing to this important matter of freight rates. The argument may be advanced that the large quarry operation can produce stone cheaper than the small operation, and, thereby pay a higher rate of freight and compete with the moderate-sized plant that is nearer the market, but that reasoning is not consistent with my experience, so I feel the moderate-sized plant supplying a limited territory is best. For my own part, I would prefer having two or more moderate-sized quarry operations in different localities in the same territory, rather than one big operation, that is, if I were dependent on commercial or railroad ballast business. If, however, I was in the blast furnace flux business and had a constant market, then a big plant by all means.

Really, I cannot see where the operations of a moderate-sized modern quarry differs in the least from a big operation except in the size of the labor force and machinery employed, and tonnage produced. From my own experience, and I am a crank on operating costs, I believe we are producing stone per ton as cheaply as any similar big operation. The fundamentals such as cost keeping, labor handling and administration are identical and the moderate-sized quarry can and should be a miniature big operation; if anything, it should be better supervised and more highly organized, owing to the very fact that it is smaller and easier handled. I truly believe that the moderate-sized quarry can and should accomplish everything that can be accomplished by the large operations, except tonnage and profit or loss in big figures, as the case may be. The same general system of cost keeping can be followed, pared down maybe to suit the smaller operation.

In our own operations, we use what we feel is a very inexpensive, simple and yet adequate system. To begin with, we carry one and only one labor account except labor employed in drilling, which we call drill labor, and labor used in stripping operations, as all expense incidental to stripping is charged to one account, stripping. Our reason for carrying just one labor account, with the exceptions already mentioned, is because we feel all labor around a quarry is really incidental to producing stone, and, is, therefore, chargeable to producing stone. I am

R. N. Van Winkle

frankly of the belief that in this one point the average operator overdoes and makes his cost keeping impractical and burdensome by trying to classify his labor into pit labor, mill labor, blasting labor, etc., as the case may be. After stripping, we take our total stripping account, divide it by the completed number of tons of stone uncovered and carry this amount per ton as stripping expense. Our drill labor is first figured out on a basis of so much per foot of drill hole, which in our case is constant as it is done piece work at so much per foot and then is figured at so much per ton, using the estimated tonnage shot.

Excepting labor, practically all the items in our cost system represent material costs only. If our steam shovel repair cost is .036 per ton, that means the material or repair parts only, not labor, has cost us .036. This same is also true for screens, cars, quarry tracks, primary and secondary blasting, which we separate, oil and waste, fuel, power, etc. Naturally, we take into account depletion, depreciation, insurance, taxes and workmen's compensation, which are items, I feel, most of us are at last carrying.

Under our cost system it is necessary to take a monthly inventory (which I would not recommend for the moderate-sized operation unless you keep up a perpetual inventory), and this inventory is taken on the last day of each month of the big items which may fluctuate, such as oil, coal, explosives and explosive supplies, stone stripped, drilling unused, stone drilled and shot and not used and stone crushed and in storage. You will find, I think, that these are about all the items necessary to consider on a monthly inventory, as the stock of small items in your supply room remain about constant, at least this has been our experience.

I am not claiming by the above system, which I appreciate I have outlined quite roughly, that you will ascertain true monthly operating costs, but I do maintain that you will get therefrom comparative monthly operating costs at no added expense, nor large consumption of time, and it will give dependable data as to operating costs, which if properly analyzed, will be invaluable to the operator regardless of how conscientious and competent he may be.

Labor handling in the modern moderate-sized quarry is a simpler proposition than in a large quarry, and pardon me if I dwell on this subject of labor handling for just a few minutes.

Labor is by far the largest single cost item entering into the production of a ton of stone. That the handling of your labor is the paramount thing that makes for success or failure, is not alone the case in the stone business, but in every other branch of industry today. The average man today feels independent and the average American revolts at the idea of being a mere machine. To counteract this feeling, I believe the most of us have adopted a piece work, bonus or reward system of some sort, and from my own personal experience with my own men I can praisingly recommend it. As a concrete example, I can say by the piece work method we at one operation in Iowa reduced our well drilling cost 50 per cent

and lengthened the life of our drilling rope 300 per cent and the drillers made from 300 to 400 per cent more per day per man. I am a believer in letting a man earn as much as he can, provided he is making me money in like proportion; and you gentlemen who have not already made adequate provision for rewarding your men by bonuses, piece work, life insurance, stock interests or some sort of reward, provided they earn it, are making a serious error, so I feel. I make it a point to keep my men interested in their work; we strive for community interest and spirit by having annual picnics, rifle shooting matches for prizes furnished by the company, and wherever we can we buy at wholesale and sell to our employes at the wholesale price, plus actual handling charges, such things as working clothes, tools, coal, etc., and just this fall we purchased in quantities shot gun shells which we distributed to our employes, as rabbits are plentiful in Iowa and when properly prepared makes food fit even for a quarryman. Today, a man's business will stand or fall, due to the loyalty of the men in the organization, and when men are allowed to make more than a bare living wage, are treated fairly as to reward and paid promptly, your biggest single cost item in quarrying—that of labor —will give you little cause for alarm.

As for the management of the moderate-sized quarry, the same identical problems are encountered as in operating a big quarry except that the man in charge must familiarize himself with every detail of the management and operation, where with a big operation it is more or less departmental with a purchasing agent, superintendent, master mechanic, auditor, etc. It is just as practical and just as easy for the manager of a moderate-sized quarry to have a good organization and a well run, profitable and well regulated business as any of the bigger quarries. The management must be farsighted and constructive, must think as big and as broadly as the management of a big operation, only when it comes to doing things they are done on a much smaller scale which at times, I must confess, are a trifle discouraging to a one time big leaguer. Every successful quarry operator plans at least a year or more ahead and my sympathies are for the man who does not, as quarrying is no longer a hit-and-miss business.

There is one drawback to the successful management of the average moderate-sized quarry and that is one cannot afford to carry in a small organization highly-trained men such as are warranted by the bigger operations, but I am of the opinion that this basic industry in which we are so vitally interested has now progressed to the point of where we can afford to have and support a few intelligent men who are qualified by education, training and actual quarry operating experience, to act in a constructive consulting capacity for the benefit and guidance of the moderate-sized quarry operator.

There is a tendency among moderate-sized quarry operators to be satisfied with what they are doing, and I have found that the man who is satisfied is the man who thinks he knows it all, or he is the man who has seen no other quarry operations; in fact, is the man who has stood still.

I am sure that all of us at times who have gone through the quarry school of experience have run up against operating problems where we would have welcomed and paid handsomely for the unbiased opinion of some experienced, successful operator. It is true we might turn to a competitor, or we might turn to the so-called sales engineer, but the question most likely would be, are they unbiased? I will venture to say that more money has been actually wasted, mind you *wasted,* in the quarry industry, than has ever been made therefrom through egotistical, snap judgment and promotional advice.

Discussion of Mr. Van Winkle's Paper

CHAIRMAN SCHMIDT: Gentlemen, are there any questions that any one would like to ask Mr. Van Winkle?

MR. STEWART: How do you classify your men to know whether they are actually working in the quarry, or doing repair work; and, how do you take care of them?

MR. VAN WINKLE: There is a big difference in our state. We classify on our payroll. The timekeeper takes care of that. We put it under the headings like *a, b, c,* and so on. The timekeeper, making up the payroll, distributes the labor. We have saved quite a bit of money in our operations out there by classifying our labor.

Association Activities and the Stone Industry

By R. N. VAN WINKLE
General Manager, Hawkeye Quarries Co., Cedar Rapids, Iowa

PERSONALLY I have been identified with the quarry industry over 10 years and it has been a business of every man for himself, and I for one am truly and heartily in hopes that the activities of this association, the annual meeting of which we are now attending are going to put, and I feel they will put, with proper interest and support from you gentlemen, the quarrying business in its rightful place among dignified industries.

While I am fully aware that what I now have to say has no bearing whatsoever on this paper, I want to take this opportunity to make just a few remarks regarding the activities of the crushed stone business in Iowa. The quarry business has not grown and progressed in Iowa as it has in other states, owing principally to the fact that Iowa has been very negligent in her road building program, but our future in the stone business lies very near and directly ahead of us. From the latest available official figures Iowa on December 1, 1923, could boast of only 415 miles of paved roads; that is to say in our state highway system, but it has 3377 miles in this system built to line and grade ready for pavement. We crushed stone men in Iowa are not overlooking this fact, and we organized an association just about a year ago, and while we are still pioneering, you might say, our association has benefited us far more than our fondest expectations. I know at least two members of our local association are members of this national organization and if I can carry my ideas to completion, I can almost assure you that a year from today 75% of the members of the Iowa Stone Products Association will be members of the National Crushed Stone Association.

CHAIRMAN SCHMIDT: Are there any other questions?

MR. GRAVES: How many membership applications did he say he wanted? (Laughter.)

MR. VAN WINKLE: I said that a year from today 75% of our members of the Iowa Stone Products Association would be members of the National Crushed Stone Association.

Convention Committees

CHAIRMAN SCHMIDT: I will announce the names of the committees that I omitted this morning.

Nominating Committee

W. Scott Eames (Conn.), Chairman
H. E. Bair (Ohio)
A. R. Wilson (Calif.)
B. D. Pierce, Jr. (Conn.)
W. G. Swart (Minn.)
C. M. Hunter (Va.)
E. C. Dodson (Texas)

Resolutions Committee

John Rice (Pa.), Chairman
B. D. Pierce (Conn.)
W. L. Sporborg (N. Y.)
O. M. Graves (Pa)
Norman Hely (Mo.)
H. H. Brandon (Ohio)

Credentials Committee

A. P. Sandles (Ohio), Chairman
J. J. Sullivan (Ill.)
C. A. Freiberg (N. Y.)
H. T. Clews (N. Y.)
C. E. Klaus (Mo.)

Auditing Committee

James Savage (N. Y.), Chairman
C. M. Doolittle (Canada)
F. T. Gucker (Pa.)
T. I. Weston (S. C.)

President Sloan Appoints 1924 Executive Committee

PRESIDENT-ELECT J. J. SLOAN announced on March 5 that he had appointed B. D. Pierce, president of the Connecticut Quarries Co., Bridgeport, Conn., and H. E. Bair, general manager of the France Stone Co., Toledo, Ohio, to serve with the elective officers as the executive committee of the association for 1924.

Exploration and Geological Examination of a Quarry Property and Their Relation to Financing

By D. B. Rush

Engineer, R. W. Hunt Co., Chicago, Ill.

THE only conceivable reason for anyone *operating, opening* or *desiring to open* a quarry property of any kind is for the purpose of making money. A certain amount of capital is required. In a few instances, this capital may be furnished by a corporation, which desires to make money indirectly, by the direct saving of money in the production of their raw materials.

In by far the greater percentage of such proposed operations, it is necessary for the promoter or the future operator to go outside of his immediate circle of friends to obtain enough capital for the venture. And this capital can only be obtained when a sufficient assurance has been given that there is, or will be, enough security in the property, when developed, to justify the desired loan, and further, that the operating plant itself will produce a reasonable margin of profit.

This assurance to the financier should, and generally does come, in the form of a written opinion, or report, upon the proposed development, signed by a reputable firm, that is properly equipped to make such an investigation, and one whose engineers have had a long experience in such work. It is physically impossible for any one man to properly investigate, thoroughly analyze and report on a property of this nature.

Our experience has been, that in the majority of cases, a few of the interested parties in any proposed scheme, will get together, go over the property and send in some random samples to our chemical laboratory for analysis. In case, any or all, of these samples prove to be of value for the purpose intended, we generally receive a call from a few principals in the proposed scheme, who desire to obtain knowledge as to what it would cost to get a complete engineering report on the project that they can lay before the gentleman whose capital, or influence, they desire to solicit in the promotion of the proposition.

As a typical case, let us assume that the clients desire an investigation of a quarry property to determine whether or not the materials contained would be suitable for the manufacture of portland cement, and whether they would be justified in building a plant for its manufacture.

After all the facts regarding the actual ownership of the property, its present use, etc., have been determined, the engineer suggests that he send a competent geologist to spend two or three days going over the property and to obtain representative samples, properly identified, for analysis, and that he would then, on the basis of this man's opinion, make a preliminary report stating whether or not in his judgment it would be advisable to go ahead and make a complete investigation of the property, and if so, what the approximate cost of this investigation would be.

This geologist must be a man of long experience, not only in investigating properties for cement plants, but one that has spent years investigating properties of all kinds, because in case it develops later that the material cannot be used for making

D. B. Rush

cement, it is entirely possible, and in fact generally probable, that the material can be put to some other very valuable use. It is also possible that in this more or less detailed examination made by a capable man, he may run across certain other materials that are more valuable than the limestone itself.

In this connection, it may be of interest to you to know that the greatest deposit of fullers' earth that has ever been discovered in this country was originally promoted and offered for sale as a material for making portland cement, and when it was found to be unsatisfactory for this purpose (no real engineering investigation having been made upon it) it was abandoned and lay idle for over 10 years. During this period, the demand for fullers' earth for use in oil refining exceeded the domestic production by thousands of tons annually.

Suppose that the preliminary report is favorable. In other words, assume the geologist has found two workable seams of limestone, the first of which the analysis shows to be a high grade quality of cement-making material. The indications are that there is enough of this quality of material to run the average plant for 20 to 25 years; that further back in a bluff and above this formation there is a tremendous amount of shale or clay of a quality that can, in all probability, be used to combine with the limestone. He notes that a considerable portion of this property has been weathered into gullies and ravines, and that in many places what is known as a channel sample of the rock may be taken without the trouble and expense of diamond drilling. He lays out in his own mind the tentative scheme for whatever drilling is necessary and estimates its cost. When this report is received, if it has favorably impressed the interested parties, they will generally agree to guarantee the expense of a thorough investigation. But *in case the report is unfavorable,* the entire matter is dropped right there with practically no heavy expense to anyone.

The next step is to arrange with a commercial drilling organization to send to the site the proper type of diamond core drill and a capable drill runner. We specify a diamond drill in this connection, because of the many costly and painful attempts that have been made in the past to manufacture and use a core drill that is less expensive. Where the complete log of the strata is known beforehand, it is sometimes possible to use a carborundum or ball drill with success, but where this is not known the diamond drill is the only one that has so far successfully cored all of the commonplace formations. There are several companies manufacturing and operating these drills and it has been our own policy to select the company having a branch office in the district, or who have men who have had experience with that same general structure.

The first step on arriving at the site is to make a complete, careful and accurate contour survey of the property, carefully locating the tracks, right of way, water courses, inside drainage and any buildings or structures of any importance, together with a careful location of all section lines and corners. When the resulting map is completed, the field engineer lays out thereon the approximate location of a series of diamond drill holes so as to properly prospect

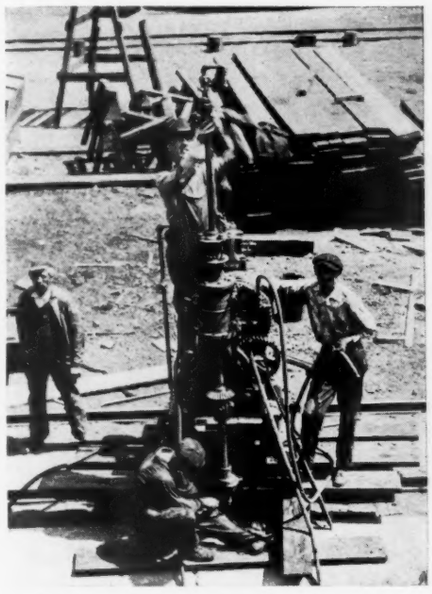
the limestone, and also a series of hand auger holes to obtain the depth of the overburden, and also, the general character of the upland shale and clay deposits. Too much stress can not be laid upon the value of accurate information on the overburden, because it is not only necessary to determine the method and estimate the cost of removing this material, but it is also necessary to plan for the proper disposal of the surplus which often may be the deciding factor in the success or failure of the enterprise.

As soon as the drill arrives, which will usually require a week to ten days, it is started and the *actual examination of the value of the property* goes forward. The speed of the drill quite naturally depends upon the character of the various strata drilled. A fair average of the footage of a standard 2-in. diamond core drill in such material we have found to be about 25 ft. per day. While the drill is going along on this first hole, the rest of the prospect holes are located in the field as close as the physical character of the ground will permit to the locations as established on the contour map. Also the hand drill holes are located and two or three laborers are started operating this hand rig.

Also at this time a series of core boxes are made, preferably about 6 in. longer than the barrel of the drill, into which the small cylindrical cores are laid exactly as they come out of the core barrel. When the first hole is finished and the core properly marked to determine the exact elevation of each particular section, a lid is securely fastened on the top, the box is marked with the location number of the hole, and is sent to the home laboratory for complete analysis. The drill is next moved to a succession of holes that are believed will establish a sort of a general control of the entire property, and furnish information from which a structural cross-section of the property can be made. From this, a decision can be made as to the exact depth for the remainder of the drill holes, and it may be that it will indicate to the engineer the necessity of slightly revising his original scheme of locating these holes.

When the drill cores have reached the laboratory, they are gone over by the office engineer or chief engineer, and also, by the chemical engineer, and these men after studying the written report received from the field engineer divide this core into a certain number of sections for analysis, the exact number depending on the thickness of the various strata passed through, and upon the care with which they know a drill core from such a particular region must be tested. Assuming that the first drill core has penetrated 30 ft. of limestone, in addition to whatever overburden there may be, and that it is quite evident that it has passed through two distinct formations of limestone averaging 15 ft. each in thickness, they would then very carefully calculate the percentage lost in the actual drill core as received, and the depth recorded in the field, and in case the core averaged about 95% complete, as it should do (See Fig. 3), they will in all probability divide each 15-ft. section of limestone core into three sections each 5 ft. in length and crush and carefully analyze each section separately.

If the result of this analysis indicates that there are only the two marked divisions in the character of the stone, they will immediately advise the field engineer, and will decide that in the future it will only be necessary to run one analysis on each separate bed. On the other hand, if the analysis of the material shows quite a variation, either between the beds or in the various parts of the beds themselves, as is often the case, it will then be necessary to analyze each core at 5-ft., or even shorter intervals. This latter condition may eventually cause a prohibitive expense in the actual quarrying operations.

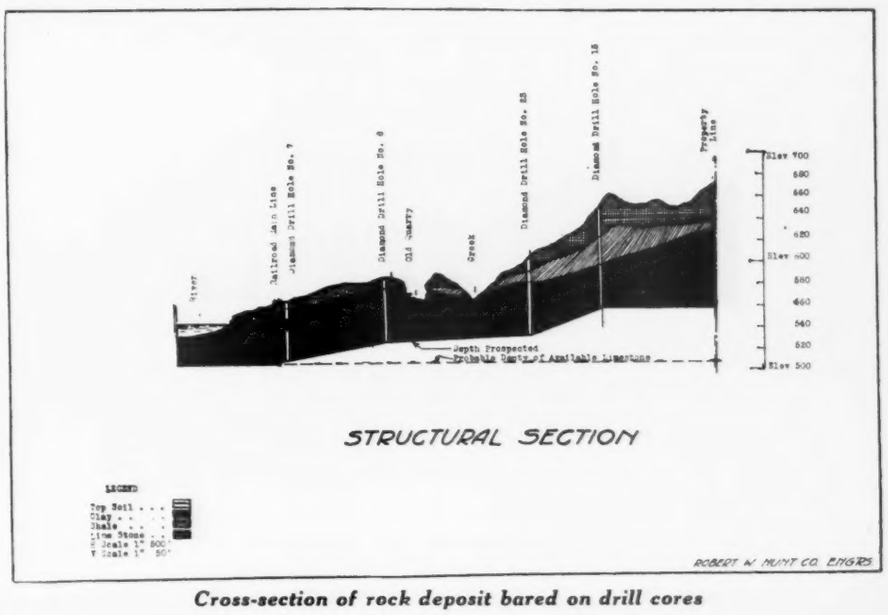


Typical diamond drill operation for quarry exploration

The same process is gone through with the cuttings or samples received from the hand drill holes. These samples, of course, are not in quite as perfect a shape as those made by the core drill, but if carefully taken, either wet or dry, and carefully identified, as to depth, are accurate enough for all practical purposes.

As a rule, if the analysis of the cores, from say the first half dozen holes drilled on the tract, indicate that the property may be even a little better than was first anticipated, we generally find that the owner, or promoter, feels convinced that his property is good enough, and that any further investigation would entail useless expenditure. However, at this point, if such a point is reached, it is of vital necessity to convince the client that be must not stop, because not enough information has been gained, either to make an honest report on the property, or to safeguard his own interests after the plant is in operation. Many plants of all kinds, using stone or mineral as a raw material, have been built on a basis of such incomplete investigation, and in the majority of cases it will be found that within a few years the company operating the plant either sells or is sold out at a loss, and a new organization takes over the plant, which immediately finds it necessary to completely revamp the methods of operation, and in many instances, the plant itself.

Possibly all of the holes drilled up to this time have proven, as above stated, to be a little better than expected, but before the drilling is finished undoubtedly holes will be sunk that are very disappointing, and these are the holes that actually control the location of and operation of any successful rock products plant. It is obvious that the holes showing a poor quality of stone or even as is sometimes the case, a complete absence of stone, indicate the site, other



Cross-section of rock deposit bared on drill cores

things being equal, where the plant should go in order to conserve the better parts of the property for the operating of the quarry. In other cases, these bad holes may make it advisable to entirely abandon *a part of* the property, or even *the entire property*, and seek a location elsewhere.

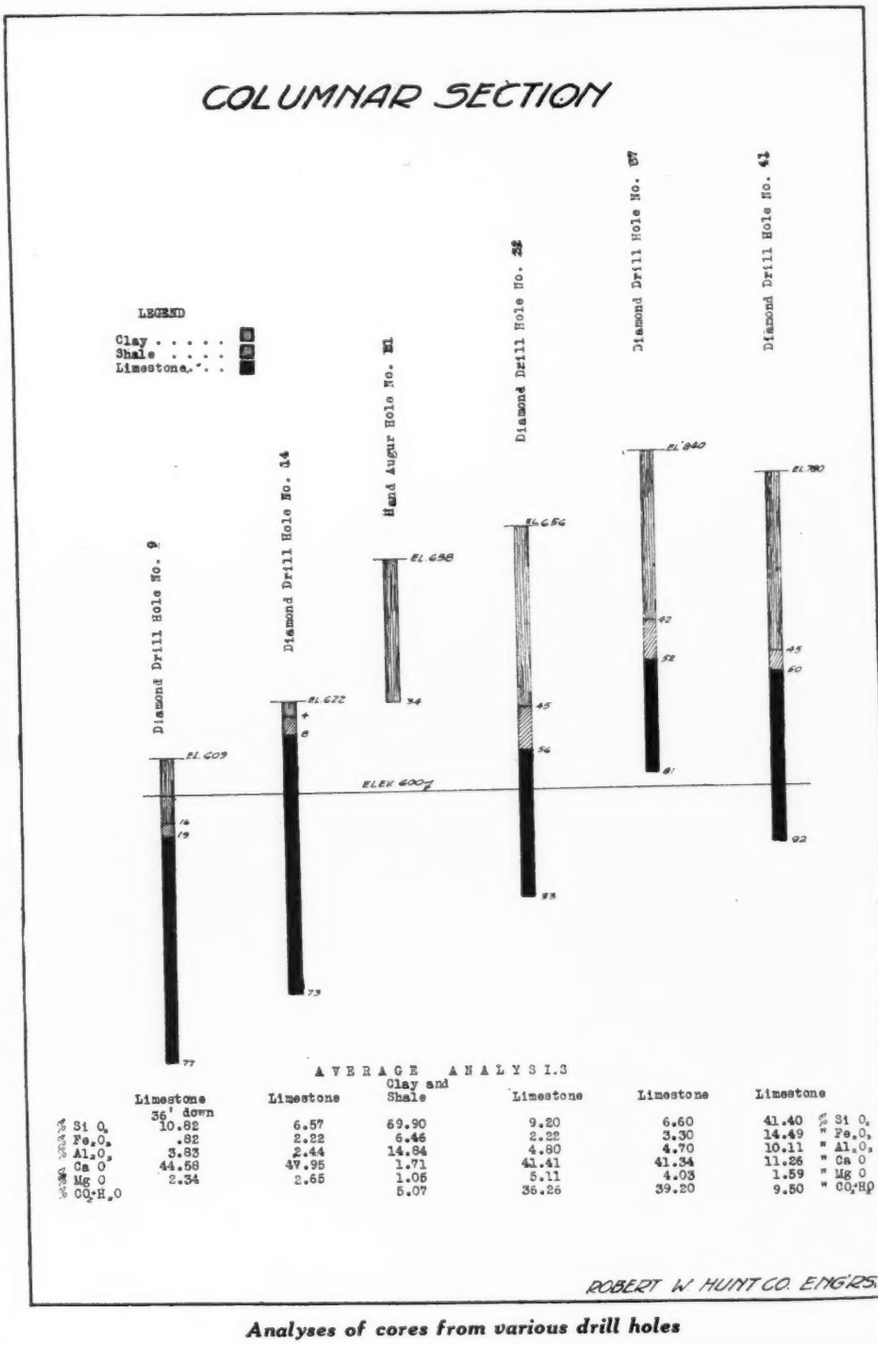
Another one of the many duties of the field engineer, while the drill rigs are in operation, is to keep up his estimates of quantity, and to make careful notes of the availability of the material; that is, whether or not it is possible, or will be possible, to economically quarry the desired stratum in the location found, also to get a good idea of the general environs of the property; to get whatever information he can as to the amount of the product that may be expected to be used in that particular district; the service of the railroads in that locality; all information necessary to the water supply and drainage of the district, and the probable character and price of labor, whether or not it will be necessary for the company to go into an extensive housing project, or whether the adjacent towns and railroads combined can furnish the proper transportation and labor. This last phase, of course, is one that is subject to a considerable difference in opinion, but the engineer, schooled in this sort of thing, is the best man to render an unbiased opinion on the subject, a subject that is one of the most vital questions in the successful operation of any venture. Another important duty of the engineer is that he must obtain copies of all deeds, leases, easements or other legal documents relating to the property and must *verify* the ownership of each parcel in the county recorder's office.

When enough drill holes have been put down and the results analyzed sufficiently to justify a clear cut, straight forward report on the quantity and quality of the material, the diamond drill is returned to its owner, the field engineer packs up the remainder of his samples, maps, data and what is left of the hand auger and returns to the office to start on the preparation of the report.

This report must be one that is *honest, unbiased*, if possible *meet the expectations of the client*, one that *he can use in the successful sale of securities*, one in which the *banker has faith*, and finally, one that develops *to be true* when the the plant is put into operation. Further, although it is not expected at the time, it must be a report that will stand the acid test of a court proceeding in case any litigation later develops relative to the value, ownership or operation of the company.

There are almost as many types of reports issued as there are engineering firms making them, but the consensus of opinion of most modern engineers is that the first one or two pages of the report contain a concise statement of the authority for making same, a general statement of the scope of the report, a paragraph summarizing the general results of the investigation and an even more concise statement of the conclusions and recommendations of the engineer. This will immediately enable the banker, or financial man, to get in plain English the gist of the entire investigation without bothering himself with the details.

Following these statements should come in logical order a detailed statement giving the ownership and acreage of the property; a detailed statement of the methods used, and the amount of examination and prospecting, that was done; a chemical section devoted to a record of every complete analysis made and their proper interpretation; a statement of the quantity of raw materials available, both proven and probable; a statement of the expected quarrying conditions; an analysis of the general transportation problems involved; a mention of the one or possibly more plant sites, with a discussion of the relative merits of each; and finally, a report of the housing and general sanitary conditions of the district. Following this should come the exhibits which should consist of a general map, preferably a geological one, showing at least one entire state and the location of the particular tract; next a county or road map showing in more detail the immediate environs, its general accessibility, etc.; third, a large scale contour map of the property itself, showing acreages, land corners, tracks, rivers, structures and any other natural or artificial features; fourth, a property map preferably on the same scale, showing the



Analyses of cores from various drill holes

location of every drill hole or channel section together with its identifying number; fifth, one or more structural cross-sections of the property as nearly to scale as it is possible to make them; and lastly, a graphic record of every drill hole put down with its relative elevation, the depth and thickness of every stratum of material passed through, and the accompanying chemical *analysis of each particular and separate bed.*

Now, if as originally assumed, the investigation of this property indicates that it can be used to *manufacture portland cement,* it is often desired by the promoter that we actually manufacture cement out of materials taken from his property. This, although a trifle expensive, can and is done quite often. A sufficient quantity of the limestone and shales are properly mixed, crushed and pulverized in the physical laboratory and sent to an experimental rotary kiln about 10 ft. long and some 2 ft. in diameter, where it is burnt under practically the same conditions as obtain in a commercial mill. The clinker in then ground and pulverized, and in the course of this grinding and pulverizing sufficient gypsum is added to regulate the set, and finally, a finished portland cement is produced. Some 6 or 8 lb. of this material is then delivered to the cement laboratory, where the complete series of cement tests as outlined by the American Society for Testing Materials is applied, and the standard form of cement report is furnished.

In case it is desired to construct *a lime plant,* the limestone is burnt, and if desired, *hydrated* and the American Society for Testing Materials tentative tests for hydrated lime applied. In case the product is to be used for *fertilizer,* generally the chemical analysis and screen or fineness test on the crushed material is sufficient, and as many grades, or sizes, of rock may be made as desired.

In the case of *gypsum products,* plaster of paris may be manufactured and properly tested.

In the case of materials, such as limestones for ballast, concrete aggregates, etc., it is not necessary that such detailed chemical analysis be followed. The tests applying to such material are those of fineness, absorption, abrasion, wear, strength in compression and, sometimes, hardness. Suppose the expected contracts for its use are governed by such regulations as that of *screening the aggregate to a set scale or fineness modulus,* this can not only be satisfactorily done in the laboratory, but it might be of interest to you to know, that at present, there is a scheme being put into practice for screening the various sizes of either stone or sand and gravel into separate tanks or bins that are supported above a belt conveyor the entire length of the bins. The feeders to this belt are arranged so that any quantity or proportion of any size material can be fed to this moving belt and deposited on the truck or car in any desired proportion, or with any desired *fineness modulus.*

Market Surveys and Quarry Sales Possibilities Analyzed for Financiers

Wm. Chapin Huntington
Business Engineer, Chicago

WHEN I asked one of my good friends in the National Crushed Stone Association what the subject assigned me was meant to convey he said that what you would really like to know is, "How can I convince the banker that my business is a real business? How is the quarry industry to obtain more capital?"

I put this question up to the first banker I met and his reply was, "Tell the truth."

There is no question about the willingness of yourselves or any other responsible group of American business men to tell the truth to your bankers or anyone else who has a right to hear it. But do you always know the truth? I mean, have you got all the facts about your business thoroughly in hand, ready to present? I am a fact-finder by profession and the best business facts I get are not from books but from men. Accordingly, when I accepted the honor of addressing you on this subject, I made a little business survey on my own account, and asked a number of very representative bankers how they felt about the quarry industry. I do not undertake to defend the correctness of their conclusions. We ought to know them because it will help us to prepare to give the banker the information he wants and to meet his objections.

Here are some of the statements at random:

Confesses Lack of Knowledge

". . . I have no special knowledge on the subject. As to current loans, I would be willing to loan money to a quarry enterprise the same as to anybody else, subject to the same conditions. However, if it were a case of a bond issue to run from 10 to 20 years, I would not favor it. I do not know just why, but I would not favor a bond issue on a quarry enterprise. . . . The quarrymen ought to have an association like the Portland Cement Association, which has done so much for its industry. . . ."

William Chapin Huntington

Favorable to Current Financing

". . . I am regularly making loans to marble, brick and other building materials industries. I have no objection to loaning any of these people.

"My rule in making these loans is to disregard fixed assets altogether and consider their receivables, which ought to be 99% good and should about cover their liabilities. After that I look to see if they are doing a good continuous business, and, if so, I consider their inventory of stone produced and stocked, assuming there is a ready sale for these.

"As to long term financing on quarry enterprises, I have no knowledge whatever. . . ."

Ethics, Price-Cutting, Uncertainty of Deposit

". . . The crushed stone business is characteristically local and intrastate. In my opinion, there is room for improvement in ethics. Experience shows that with these people, business is either a feast or a famine. There is terrific price-cutting in order to get business.

"The industry is typically local and the material is found in quantity almost everywhere; hence the supply generally exceeds the demand. The result is the temptation to scrambling for business and ruthlessly cutting prices in order to get it.

"In the past in making quarry loans, we have not considered the receivables because they do not amount to much, but founded our loan on a mortgage on the property.

"However, stone is underground, out of sight, and very often it is impossible to know just what is there and how much. On one enterprise where we had a mortgage, after working the quarry for a time, the good stone ran out and they struck a grade of stone that was useless. There was nothing to do but get a lease on new land. In the meantime, the mortgage had nothing back of it but a lot of useless stone and land of low value. . . ."

Politics

". . . Owing to the local character of the

quarry industry, the market is to a large extent in municipal improvements, which means dealings with city officials in order to get an outlet for the product. This gives the business a political aspect which is unfortunate. . . ."

Market Information Needed

". . . As far as the current commercial credit is concerned, I would consider the quarry business just like any other business. However, I believe that more quarrymen know their costs than know their market.

"As to long time financing, I do not want anything to do with it because it is really nothing but loaning on real estate. You never can tell—a quarry may open up at a certain point but changes are frequent and because of the low grade of the commodity, freight rates put an outside limit on the shipping radius, a condition which is all right today but may not be tomorrow. . . ."

Personal vs. Industrial Credit

". . . We have never done any stone financing except in one case, and should not have gone into this except for the fact that it came from large interests about whose strength there could be no question. In other words, it was a case of personal credit rather than the credit of the quarry industry itself. . . ."

Management the Vital Factor

". . . The vital factor in stone operation is management. The loans I have made have been entirely on this basis. However, it is undeniably true that bankers do look askance at quarry operations. It ought not to be so because stone is undoubtedly basic and essential. One of the troubles is that a lot of small fry are constantly breaking into the game and hurting the situation.

"It is going to take a long time for bankers to change their attitude. Many people are now entering the stone business and expanding their operations. I believe most of the financing comes from the sale of common stock. This is the way they ought to begin anyhow. After they have been able to interest their friends and are making progress it is time enough to talk to a banker. . . ."

An analysis of the statements of these bankers, and other statements not reproduced here, brings out the following points:

Lack of Knowledge—In the first place, many of the bankers interviewed confessed that they did not know much about the quarry business. There is only one remedy for this and that is to tell them about it, but you cannot tell them about it, satisfactorily at least, unless you have the facts.

Unfavorable Attitude—In the second place, it appears to be admitted even by those who know the quarry business best, that "bankers are inclined to look askance at the industry." Part of this attitude comes from lack of knowledge and will disappear as you better inform your bankers; but a large part of it is founded on certain fundamental objections. Let us examine the principal ones.

Common Occurrence—They say that stone deposits are wide-spread and the stone is found almost everywhere, so that it is in a way everybody's business. One good answer to this is that there is stone and stone, good stone and bad stone, and by insistence on quality, grading and service, the unreliable producer who cannot furnish these essentials will have a hard time to compete.

Over-Production—Again, it is claimed that "many small fry" are continually getting into the business without experience or tradition or sense of responsibility. In answer to this, some of the best producers inform me that it is now very hard to get into the stone business on an economical scale without investing about a quarter of a million dollars. Most of the "small fry" will automatically pass through this screen. However, there will be times when uniformed people will try to rush into areas which are already over-produced. The best brake on such people is the FACTS. If it can be clearly shown without prejudice just what the market will stand and that the existing capacity is more ample to handle the needs, many will be deterred by such a presentation.

Ethics—Again, many of the bankers speak of the unsatisfactory and unstable price situation, which they say arises out of the fact that many stone producers, particularly in dull times, go out and get business at any price and then recoup in times of good business by screwing up the price unconscionably high. My experience in many other industries has taught me that financiers never fail to inquire about this ethical situation in an industry and whether there is a spirit of live-and-let-live.

Nothing will help to bring about proper business ethics quicker than sound information in the hands of everybody—FACTS.

Uncertainty of Deposit—You will note the stress that some bankers lay on the uncertainty of the extent and uniformity of a stone deposit. You have just heard a very able paper by D. B. Rush on this subject. For your own sakes and for the sake of those who cast their lot in with you, you ought not to spend money opening up a new quarry operation without a thorough geological examination. Again a case of getting a certain kind of FACTS.

Management—One of the best informed of the bankers interviewed laid principal stress upon management as being vital to successful quarry operation. I do not see what there is peculiar to the quarry business about this; good management is the crux of other industries and not especially the quarry industry. However, intelligent, far-sighted management is impossible without the FACTS.

There is no royal road to favor with bankers. It is not going to be the work of a month or even of a year to give your basic industry the prestige and standing it should have with them, but it can be done if you will get the facts about your industry and use them. Roughly, I might classify these facts in three divisions:

1—Facts about the extent and character of the stone deposit which ought to be learned before the operation commences.

2—Facts about costs. In this field tremendous progress has been made in the last few years.

3—Facts about markets. What good is it to produce the stuff if you can't sell it and sell it at a profit? One of the most competent of the bankers consulted said he thought quarrymen as a rule knew a lot more about costs than they did the markets for their product.

You ought to know just how large your market is; how much stone is consumed in it; what classes of customers consume this stone; what can you do to increase the consumption; how you can demonstrate to architects and engineers the necessity for quality and grading; with what alternative materials you are competing; what new uses can be dug up to tide over the dull period.

All such facts as these and many more would be brought out in a real market survey. Mostly, they are not contained in any book but have to be gotten by the exercise of some imagination and a good deal of shoe leather. I mean that these facts are in business men's heads—in your competitors' heads, in the heads of men in allied lines—architects, engineers, contractors, builders, city officials and others. In making a real market survey, all such men should be consulted and all their experience gathered together, sifted and analyzed. I do not believe you have any idea how much information there is any group of half a dozen quarrymen if it were only drawn out.

When you can convince bankers that you have a uniform deposit of ample extent, economically workable, that your costs are low as the other fellows', and that you have a sure market for your product and that you and your neighbors are co-operating on the principle of live-and-let-live, you will find it about as easy to finance a crushed stone industry as any other industry.

Discussion of Mr. Huntington's Paper

CHAIRMAN SCHMIDT: Are there any questions any one would like to ask Mr. Huntington?

MR. SPORBORG: Where are you to get these facts?

MR. HUNTINGTON: In most industries these facts are in people's heads. Unfortunately, a doctor can not go to just any place to get facts, nor can the lawyer, but the business man has many places to go. There are a few industries lately that have done a good deal of self-examination. Several industries have gotten together and worked co-operatively where a good many basic facts are available, but the best method is getting squarely to the consumer of the product and asking him about it.

There are some very valuable reports that you can get from the government and some of the state geological surveys who have done excellent work. Most of the work is lying around, and the people who have done it do not know how to put it up, and give it to you. There are all sorts of information in the files of departments of the government. However it has to be reduced to form and put together.

I do not know how to describe fact getting except to have some imagination and use a lot of shoe leather. (Laughter)

Disposal of Screenings and Fines as Agricultural Limestone

By E. M. Lamkin

Chairman, Board of Directors, National Agricultural Limestone Association

IN ACCEPTING the invitation of your program committee to talk to you gentlemen on the subject of disposing of your screenings pile, I realize I am talking to men who have given years of thought to this subject and therefore if what I have to say adds something to your thought I will feel our time has been well spent.

You gentlemen gathered here this week are engaged in producing and marketing a commodity which nature, with the dawn of every new day furnishes you with an ever increasing demand; this demand is ever bringing to you a greater problem in disposing of your fines; this is weighing heavily on your mind; as it has a direct bearing on your production costs and consequently on your profits, time spent in research and efforts to find new uses of this waste product is well spent.

Is more research work by our chemists necessary to help us find a market or is there here before us a market that only needs developing?

Research is becoming more and more a vitally important factor in industry. Its value is being recognized by the small manufacturer as well as the large one and as research spreads, mortality in business will be reduced.

Organized research as a part of manufacturing operation is, however, a new thing in the world. Fifty years ago it scarcely existed. Before that time there had been development and progress, but on the part of the manufacturers it was accidental and unsystematic.

The development was mainly along two lines. Either a bright man in the operating department had an idea which was developed into practice, or a rank outsider had an idea or process which he persuaded the company to try; in either case progress was necessarily slow.

Organize for Research!

I am urging that the stone industry should organize research departments, for it is only through this method that a satisfactory solution to your problem will be found.

The General Electric Co., for example, keeps about 150 trained men with numerous assistants at work at all times on research work, while the Western Electric Co. employ some 1500 technically trained men devoting their entire time to research.

There is in the United States over 500 manufacturers maintaining research laboratories, according to a recent report of the National Research Council, and while this list is incomplete, it shows an awakening on the part of the manufacturers to the importance of organized research.

Waste utilization is the key to success in many enterprises and as competition becomes more keenly felt, so must greater thought be given to profitable disposition of our waste materials.

Most of the lime manufactured in the United States is burned in various types of shaft kilns; regardless of the method, it is essential that a strong draft be maintained.

The necessity for good draft is a great detriment to the utilization of small stone, for if large quantities of the finer materials are mixed with the larger masses, the draft is greatly retarded and imperfect calcination results.

Most lime manufacturers hesitate to embark on byproduct enterprises because the uses, demand and marketing conditions of the new products are unknown to them. Consequently it is very desirable to consider first of all any possible method by which a large proportion of the total rock might be converted into lime. With this in view, several lime plant operators have installed the same type of rotary kiln as used by the portland cement manufacturer.

The rotary kiln is an expensive type of equipment that could scarcely be justified, except in connection with very large operations and when you realize the average quarry is not large, this method is, no doubt, unsatisfactory.

The ever increasing use of the automobile, demands more and better roads. This, however, represents only a small outlet for your fines.

Limestone screenings are used with success as fine aggregate in concrete for various purposes. Concrete brick are produced with screenings and are giving satisfactory service, particularly in house construction.

The demand for agricultural limestone is ever increasing, and I am of the opinion that it now represents the greatest and best possibilities of disposing of your fines.

If you should decide to dispose of your screenings pile as agriculutral limestone, you then meet a greater problem than you now suspect.

We are educated to produce stone in large quantities which is sold at a very small profit. The demand for this product is ever increasing, therefore, you have not built up a substantial sales force. This is of as great importance to you as the production of stone.

Agricultural limestone, regardless of the form in which you find it most economical to produce, will not sell itself. Real study and effort must be put forth.

The Market for Agstone

You need not worry about the market, as the United States Department of Agriculture has told us time and again that 90% of the soils of the United States need lime. The state of Ohio requires 3,000,000 tons annually. However, as far as I can determine, there is only about 700,000 to 800,000 tons of screenings produced in the state, regardless of the fact that Ohio stands second in the production of limestone in the United States. Her consumption of agricultural liming material is less than 200,000 tons per year. Pennsylvania stands first in the states in the production of limestone, with a production of fines somewhere around the million mark. However, this state requires something over 1,500,000 tons annually. At this time her consumption is less than one-fifth of this amount.

The stone you are producing should be taken into consideration first, as you can no more hope to sell a farmer the wrong kind of stone and get away with it for any length of time than your grocer can expect to continue to furnish your table with an inferior grade of vegetables. Therefore, I say to you, don't try it.

At the present time, the farmer knows very little about the liming materials he purchases. He has, however, a good knowledge of its uses and results. His next step is bound to be in the direction of more knowledge in regard to the product he is using.

The condition that now applies to agricultural liming materials, only a few years ago applied to fertilizers, but today you cannot fool the majority of the farmers with a poor grade or a low analysis. He knows a 2-8-2 at $12 per ton costs a great deal more per acre than a 4-16-4. Therefore, it is going to be only a matter of a short time before the farmer will be buying his liming materials on an acreage basis as this is the only consistent method he can use.

The farmer has an advantage over the city man in his buying, as he is protected in most states by certain laws. The states that have not already done so are fast adopting agricultural lime and limestone control laws. Before you will be permitted to make shipment of your materials in certain states, you are required to take out a

license and in so doing you give the state the analysis of your material, the same as you guarantee to deliver it to the farmer. These guarantees are the basis on which your materials are judged and purchased. If they are not up to standard, you will find your state agricultural college and experimental station will soon condemn them.

Agricultural liming materials are sold for mainly one purpose, and that is to neutralize the acidity of the soil and for you to claim it will serve as a fertilizer is false. No false statements are necessary as you can work better in harmony with the fertilizer manufacturers than you can without them, as lime and fertilizer work hand in hand to make the farmer more prosperous.

Agricultural limestone must be, first of all, available and by that I mean it must have the ability to neutralize the soil acidity within a reasonable length of time after application. Therefore, in trying to secure your share of this business you should take into careful consideration the preparation of your stone for the market. If it is a hard dolomitic stone and not soluble, it requires a greater amount of breaking down to make it available than a soft and more soluble stone.

While some colleges have tried through different tests to show the solubility of different stones, they have come to no conclusive method whereby they all agree on this subject, therefore, until we have further proof we are lead to believe the softer stones are more readily available than the harder ones. There is, however, some question in my mind regarding this. The solubility of the stone controls its availability. Therefore, a stone that is not readily available, should be much finer than one that is.

Dr. Thorne of the Ohio experimental station has said that only liming materials that will pass a 10-mesh sieve are fine enough for agricultural use; there has always been a question in my mind of just what value are the larger stones.

As my time this morning is limited, I will not try to go into further details but will ask those interested to join me at the agricultural group meeting, which will be announced later and then I will endeavor to anwer all questions.

Report of the Committee on Labor and Immigration

MR. PIERCE: You probably know, to some extent, from the bulletins that have been sent out what our activity has been. As far as the immigration subject is concerned, we appeared at Washington and had a hearing. The bill was first sent to the House, and later went to the Senate.

There seems to be, even here among ourselves, quite a difference of opinion as to what we should do. Since July 1, this law has been operative as far as immigration is concerned. Consequently, some sort of action seems necessary.

The Senate committee, to the minds of our committee, is rather favorable to taking some action. The House committee bill is based on 2% on the census of foreign born residents in 1890, whereas the present law permits 3% based on the census of 1910. Take for instance, Italy, from which we would get 54,000 people. Under the new law, if it becomes effective, we will get 7000 or 8000.

I get most of my information from Connecticut, where we have mostly these Italians. I believe the law that will become effective will not be the one the House is putting up, but the Secretary of Labor will have some jurisdiction, or say, in the matter. In other words, if the people of this country want laborers, it will be up to the Secretary of Labor to bring the proper kind of men into this country and the proper number.

I do not think that our committee is prepared to say what should be done, but I think something should be done regarding our immigration and there should be a new law. I really think that the Secretary of Labor is "in the saddle," and I think he is going to have a good deal to say about it. The question is whether, in your judgment, you should leave this matter in the hands of your committee.

I am going to call on Mr. Graves to tell you a little something about what we went through with in the slag freight matter. But before he tells you, I want to say that Messrs. Schmidt, Sporborg, Savage, Sandles and myself appeared at Washington. We went down on this immigration question, but I did not get much satisfaction, and the other day I wrote to Congressman Johnson, of the state of Washington. He answered my letter by saying that the bill was fixed practically all right, and that there were only a few more details to settle. The Senate chairman said that we would be notified of whatever hearings were had on the matter.

B. D. Pierce, Member of the Executive Committee 1924

MR. GRAVES: Just a word on this immigration question. Now, I think the misunderstanding which I believe is present here and in nearly every case where the immigration question is discussed is due to the erroneous impression that those who are opposed to the present House bill on immigration are in favor of unrestricted immigration.

Our present immigration law, which I think expires July 1, 1924; permits an annual entrance into this country of 3% of the alien population of 1910. Now, mind you, when that act ceases to be a law it is proposed, in the House bill, that the quota be reduced to 2% of 1890, not only greatly reducing the total permissable immigration but even more drastically reducing the immigration from southern Europe, from which section of the old world our common labor is drawn. In 1890 the foreign population of this country, which had come from northern Europe was much greater in proportion to that from southern Europe than was the case in 1910. Therefore, the reduction from 3% in 1910 to 2% in 1890 reduces by far more than a mere 1% the quotas now permitted to enter this country from southern Europe.

In fact, if the present House bill is enacted the supply of our common labor will be reduced to approximately one-sixth to one-seventh of that which we now obtain. So much is said and written on the inadvisability of increasing immigration. Those of us who are opposed to the House bill do not wish to have immigration increased but strenuously object to a reduction so severe as to limit us to one-sixth to one-seventh of the common labor which we secure under the present law.

We do not want immigration decreased to a point where common labor will practically cease to exist and force upon ourselves the doubtful theory that if we have no foreign born labor whatsoever that many of the so-called "white collar" men will be forced into the skilled labor class and that the less able and intelligent of the skilled laborers will be forced into common labor. We certainly need a reasonable supply of imported

foreign labor who are able to sing "My Country, 'Tis of Thee" with a pick and shovel. We do not need to increase our immigration to secure this result and we might even decrease it, but not to an extent which would reduce our supply to one-sixth to one-seventh of what it now is.

If immigrants are permitted to enter this country in such numbers that they cannot be assimilated into the body politic we might have acute, and even chronic, indigestion, but there is no need of frantically rushing to the other extreme and fall a victim to anemia because of a starvation diet. We believe that the virility and strength of this nation is largely due to the constant mixing of bloods and peoples and, even though up to the last few years, there has been no restriction whatever on immigration, we have assimilated all who have come to us with no particular difficulty and with some degree of success as regards national prosperity and the development of manhood and womanhood. Selective immigration by all means, and further restricted immigration as regards numbers, if that be necessary, but we are in no need of a legislative "Chinese wall" to protect us from those who wish to come to this country to work and live, in reasonable numbers. I believe that the industrial world will be confronted with immediate and serious, if not disastrous, difficulties if immigration is reduced to the extent contemplated by this bill.

Report of Cost-Accounting Committee

MR. SAVAGE: Since the meeting began, reports have been received from the different operations. The plan of cost record put out, perhaps, is not as much in detail as many of you would like to have it, but it was felt, this year, by the committee that while we cannot exchange costs in cents per ton, we can make comparisons and get percentages of our total cost. The matter was boiled down to practically the lowest terms in the seven items, on which costs were asked, and these items were all covered in reports received last year.

We received these items too late to analyze them in detail, but we have had mimeographed tabulations of the reports just as they were received. On one sheet, we have reports of 33 operations. On the other sheet, we have 16 operations in trap rock and four which might be considered as miscellaneous. They are miscellaneous, in that one operation combines, apparently, both granite and limestone, one is a porphery operation, which does not compare with the main groups. There is only one report of a sandstone operation, and one report where the kind of rock is not classified at all.

The committee would recommend another cost-accounting committee, which would, perhaps, function early in the year and request cost data on a percentage basis or one hundred cents for a dollar expended in the operations, somewhat in greater detail. We might, for comparison, send out two slips, one exactly as was done this year, and another analyzing each of the items, cost ratios for each detail of the operation and then group them, so as to correspond with a general form of report. It has also occurred to the committee that it would be well to get together a chart of accounts; and in a way, it might be called a standard form of daily report from which all of these cost items could be fixed up. We cannot get in detail the costs which we would like to have, unless they are gathered daily in the various operations. I do not know that the committee has any formal report, which will result from a complete analysis of these reports that have been received. As I said, they were only received yesterday, and the tabulations came to us only this morning, so we have not had an opportunity to analyze them in detail, but as you glance over them if there are any particular items that appear out of line, or on which you want to ask the reason, feel free to ask any questions. For instance, under explosives, is one quarry whose explosive item is only 2 $^{7}/_{10}$% of the total expense.

The next report in the tabulation of explosives represents 18%, and we might ask for those reports by number, and if the representative of the quarry who made the report is here, he could explain, for instance, why some of the explosive expenses are so high.

MR. SPORBORG: I am perfectly willing to wait and see, but I would like to ask what is proposed to be done in the way of the tabulation that Mr. Savage speaks of?

MR. SAVAGE: The following are averaged items:

	50 Quarries	30 Limestone Quarries	16 Trap and Granite Quarries	4 Other Rock Quarries
Stripping	3.44	3.40	4.06	1.31
Explosives	7.97	8.95	6.33	7.12
Labor	40.69	38.90	42.16	48.25
Supplies	12.94	12.48	13.85	12.78
Fuel	10.69	10.92	10.61	9.28
Depreciation	10.84	11.12	10.46	10.60
Gen'l expense	13.43	14.23	12.53	10.66
	100.00%	100.00%	100.00%	100.00%
Materials and labor	75.73	74.65	77.01	78.74
Depreciation and overhead	24.27	25.35	22.99	21.26
	100.00%	100.00%	100.00%	100.00%
	Feet	Feet	Feet	Feet
Height of quarry face	74.8	61.7	97.8	80.0
Stripping	4.00	4.14	4.03	1.23

MR. GRAVES: Mr. Chairman, I am of the opinion that this is valuable information which has been presented, and I move you that in accepting the report that we do so with the heartiest appreciation of this committee and give them a rising vote of thanks for the valuable work they have done.

A rising vote of thanks was extended.

CHAIRMAN SCHMIDT: The recommendation, I presume, will be to the incoming board of directors to see that a committee is appointed. That will be part of the minutes.

Now, there certainly must be some questions to be asked here, as I take it, nobody knows, not even the committees who is who, or what is what. Some percentages may be very high, while some may be very low. The high man wants to know what is the matter with the low man and the low man wants to know what is the matter with the high man. If there is any discussion on the subject, we would be glad to have it start. However, we can defer it for a few minutes and go on with our program.

Report of Auditing Committee

We can go on and receive the report of the auditing committee and defer any discussion on this matter for a few minutes, if that is the wish of this association.

The auditing committee is ready to report, I believe.

CHAIRMAN SCHMIDT: Gentlemen, you have heard the report of this committee. The speaker, in connection with this, has a report to make which is printed and which will be distributed. We have these reports here which show the sources of all receipts, and then the expenditures over here for vouchers issued. That is the secretary's report, and I think it is the best way that we can give you so that you will all see it.

MR. GRAVES: I move you that the report be accepted.

CHAIRMAN SCHMIDT: It is understood that the secretary and treasurer's report is combined.

The motion was seconded and carried.

MR. BRANDON: Just a little thought occurred to me. I think a great majority of these bulletins and reports we all want to keep as a permanent record, and I would like to offer this as a suggestion. I would like to suggest that we standardize the size of those sheets 8½x11 in., so that they will fit into a standard file. With this big sheet you have to fold it over and clutters up your file. I would like to offer this suggestion that it be adopted as a resolution.

MR. SAVAGE: I second the motion.

The motion was carried.

CHAIRMAN SCHMIDT: Are there any questions to be asked?

MR. BAIR: Who is to receive these bulletins?

CHAIRMAN SCHMIDT: At a meeting of the board of directors it was decided that a copy of this would be sent to all members.

Is there any further discussion? If there is to be no further discussion on these tabulations, no questions, no information wanted, without further digestion, we will hear the report of the nominating committee.

Use of Screenings for Concrete Products Manufacture

By A. J. R. Curtis, Manager, Cement Products Bureau
Portland Cement Association

MY remarks on concrete products manufacture will be directed to questions of immediate interest to you as stone producers.

You are concerned with two primary questions:

(1) Is crushed stone, in available sizes, a suitable aggregate for use in the manufacture of concrete products? And if so,

(2) How may crushed stone screenings be disposed of in greater quantities for this purpose?

Before attempting an answer to the first question, let me describe briefly three or four typical conditions under which aggregates go into factory-made units. First, there are units like roofing tile with very thin section, averaging ⅜ in., of which density and great strength are required. There are tamped-process block and building tile of greater cross-section—usually ¾ in. to 1¼ in.—of which less strength in the concrete is required; similarly, there are wet-process molded block requiring concrete of a consistency which flows. In addition to these comes concrete pipe and similar products with comparatively thin cross-section for their volume and size, often required to sustain extremely heavy loadings.

No Choice Between Properly Graded Screenings and Sand

Considering these requirements and the limitations which they imply, it has been found at Lewis Institute and elsewhere that for durability, strength, watertightness, ease of handling and appearance there is no great choice between sand and *screenings of equally acceptable gradation.* Both are obviously from similar materials, one broken down and rounded off by natural forces, the other shattered by mechanical means.

Actual tests of *mortars* made up with these two kinds of aggregate at Lewis Institute gave equal strength at 7 and 28 days, and variations of this test produced by changing the dependent factors, such as gradation and consistency, showed that the two aggregates behaved almost identically. However, it will be recalled that similar tests on *concrete,* using the sand and screenings interchangeably, showed higher strengths where sand was used. One explanation for this is found in the greater quantities of mixing water used with the screenings.

In the manufacture of most concrete products, particularly those used for structural and other building purposes, the quite narrow width of some one or more portions of the units, or, perhaps, the location of reinforcing material, definitely limits the maximum size aggregate which can be used. For a few products, this limitation is as low as ¼ in.; for others, it may be ⅜ in., ½ in. or ¾ in. Our recent investigations have shown that where the maximum size of aggregate is even as great as ¾ in., approximately *equal* strength may be expected from sand and graded stone.

Due to the angularity of particles comprising the screenings, they are not as mobile as sand particles and therefore in so-called semi-wet mixtures, such as used in the tamping process of manufacture, screenings require somewhat more tamping. This additional tamping must be done in the case of screenings and of course *should* be done with sand, for it adds to the strength. It

A. J. R. Curtis

is well recognized that the rough, sharp fracture of screening particles produces uniformly rough surfaces which provide excellent mechanical bond for plaster or stucco.

"Cohesion in Screening Mixtures

There is a certain "fatness" to mixtures made with screenings which seems to keep particles from dividing out as they move through the molds used in the cast or wet processes. This aids in securing smooth and sometimes almost burnished surfaces, which usually add to the salability of the product, although they may contribute nothing else of actual value. The same feature is present to a certain degree in the semi-wet tamping process. It may also be mentioned that good results seem to follow the mixture of suitable sand and screenings for tamped process products where the combined gradation is satisfactory.

Most of my hearers are quite familiar with the complaint that screenings contain dust which is injurious to the strength of concrete. This may or may not be true. I have assumed in the foregoing that we were considering screenings of acceptable gradation. Large quantities of screenings from which the dust has been blown and sold for agricultural purposes are now used in products manufacture and then suitability is seldom questioned. With the dust eliminated, screenings should make an admirable aggregate for these purposes. No serious strength reduction seems to occur with quantities of dust up to 10%, but with higher percentages the quantity of mixing water required seems to increase rapidly, strength drops off precipitately and other undesirable symptoms appear. I have a suspicion that a quite desirable quality of screenings produced by some quarries has been carelessly mixed with quarry dirt. Of course this should be avoided.

Fineness Modulus a Test of Suitability

The relative suitability of sand and screenings for concrete products manufacture may be precisely measured by means of the *fineness modulus.* The sieve analysis detects the presence of dust and reveals irregular grading or excessive coarseness; the *fineness modulus* sums up the results of the sieve analysis in just one simple figure which truly represents the value of the aggregate from the viewpoint of gradation.

Growth of Concrete Products Industry

Let me avoid a direct answer to the question as to how you may be able to dispose of more screenings in the field of concrete products manufacture. As a substitute for a direct answer, I want to sketch a picture of the concrete products industry and allow you to make your own deductions. Four years ago when the Portland Cement Association began to speed up cultivation of the products field, there were some 7000 manufacturers of block, tile, pipe and other precast units. Today there are about the same number. The output has at least trebled in four years. Those plants which have dropped by the wayside have been replaced by new factories about equal in number. At present 80% or more of the output comes from 20% of the plants, practically all of which have been built new, or rehabilitated and refinanced since 1920. The extent to which these new factories have

built up the market is clearly shown in the block and building tile field, where the output by year has been as follows:

	Block
1920	50,000,000
1921	175,000,000
1922	300,000,000
1923	385,000,000

If we convert the 1923 production of block into terms of brick and add the 155,000,000 concrete brick produced in 1923, we get the equivalent of 5,160,000,000 brick. Compare this with 6,000,000,000, the number frequently mentioned as the common clay brick output, and you will realize the market already attained by concrete building units.

As imposing as these figures may seem, they are still capable of large increase. The daily output of block averages only *933* for the *better 20%* of the factories and only *58* for the *smaller* 80% of the factories. Since some 6000 plants make block, it would appear there are plenty of small markets for the sale of screenings and plenty of small manufacturers with whom you might cooperate in developing their business. It is also evident that the quarry desiring to manufacture block and other products would find competition almost everywhere by small manufacturers who figure little overhead if any, and sometimes are satisfied with the equivalent of day wages

The Chance for "Regular" Operations

The stone producer who wants to develop a profitable business of his own in the concrete products field must be sure that his enterprise is adequately financed, economically operated and well located with respect to markets. Over half the failures have been due to poor financing. A business requiring a $20,000 plant and $30,000 tied up in inventory, stock and credit to customers proves a failure with $10,000 in the plant $200 in the stock pile and nothing in the till. Another weak point with the manufacturers is wasteful and unsystematic manufacturing methods. In the same locality block are produced for 2 cents apiece less in a good plant than in a poor one. On an output of 250,000 block a year the difference would equal $5000, or the interest at 6% on $83,000. Two cents per block would pay for a big sales campaign or extend the trucking radius several miles farther from the plant. Whether or not a given locality presents sufficient opportunity to justify another products factory is a matter which can be determined only by making a careful local survey.

One thing would seem obvious: There appears to be little room and certainly there are no flattering prospects in sight for the stone producer who joins the 80%, comprising the smaller manufacturers of concrete products. If profitable openings exist, they will be found in centers justifying well financed and well managed plant units with capacity of a million or more block annually or a comparable quantity of other products.

Report of the Railway Committee in Regard to the Interstate Commerce Committee Hearings

MR. GRAVES: Mr. President and gentlemen: I have not much to say in regard to this matter. Your committee learned that there were two freight rate cases on slag before the Interstate Commerce Commission brought by certain slag interests. One group of slag producers had instituted certain proceedings before the Commission and another group had brought other proceedings. Each group had intervened in the case of the other, so that the situation was fairly well complicated. Neither group of slag producers agreed with the contention of the other, hence the mutual intervention in their two cases. One group was seeking freight rates based on mileage and the other, vigorously opposing such a basis, was pleading for rates established on the zoning or grouping basis.

The two cases were the outgrowth of the conflicting interests of the two groups of slag producers and it appeared quite probable that if an adjustment could be made of their conflicting interests the result would be such as to bring the general freight rate structure on slag below the rates existing on crushed stone. In fact, when knowledge of the proceedings first came to us the hearings had been completed and the examiner had made his report and filed it with the commission.

If our interpretation of the examiner's report is correct, its adoption would have resulted in bringing slag rates in general below those existing on crushed stone, nor could we have appealed to the carriers for relief in the event of such discrimination if we had failed to protect our interests before the commission, as the carriers may have well argued that they were forced to give better rates to slag by virtue of the commission's ruling, should such a ruling be handed down.

The date for the oral argument before the commission was set and we had only a few days in which to act. We personally went to Washington and presented to the commission our prayer for intervention, asking that we be permitted to argue before the commission on the date set.

The carriers, you will understand, were not unnaturally opposed to the reduction of slag rates and therefore in these hearings our interest became identical with those of the carriers, in so far as it was necessary for us to show that no unfavorable discrimination should be made against stone relative to slag as regards freight rates on the two commodities. We orally presented our argument to the commission at the time stated and in the time allotted us and argued the various reasons why slag should not enjoy better freight rates than did crushed stone. We did not go so far as to claim that stone should enjoy better rates than slag but merely held to what must be considered fair by all concerned that these two competing commodities, used in general for the same classes of work and carried in the same type of equipment, should move on the same freight rate basis. Apparently our argument before the commission met with some fair degree of success.

At the conclusion of the arguments Commissioner Hall suggested that under the auspices of the Pennsylvania System a conference be held with the carriers in interest and the slag producers and that the crushed stone producers be invited to attend. At the first conference, which was presided over by Mr. Large, Freight Traffic Manager of the Pennsylvania System, there were present representatives of some eight or ten carriers, 25 or 30 slag producers, and the representatives of this association.

At an early period of the conference it became evident, first, that it would be extremely difficult, if not impossible, to satisfactorily harmonize conflicting interests of the two slag groups and, secondly, that the carriers did not propose to grant rates to slag which would in general be lower than those on stone. As our interest extended only to this latter phase of the situation, we did not attend the second conference. Little or no progress was made at this conference and therefore the chairman of the meeting referred the matter back to the general counsel of the Pennsylvania System, stating that no conclusion satisfactory to all concerned could be reached and that therefore the hearing now pending before the I. C. C. be resumed. It is the intention of Mr. Pierce's committee, unless instructions to the contrary are received from this company, to intervene in the case now pending. In fact, we have already asked leave of the commission for such intervention and that leave has been granted. It is our intent to intervene only to the extent necessary to protect our interests in so far as we can to the end that no lower rate be granted slag than are effective on crushed stone.

I think there is nothing else in particular to add to what has already been said except to state that it is my belief that this committee should be continued and, unless the convention takes contrary action, this committee will continue to function along the general lines I have indicated to you as regards the freight rate cases.

Depletion, Depreciation, Obsolescence, Repair Accounts, etc., in Connection with Income Tax Reports*

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A YEAR ago it was my pleasure to deliver a paper before the National Sand and Gravel Association at Washington, D. C., which embodied a few thoughts relative to establishing values for such natural deposits as sand and gravel and their allies—limestone, stone, and other quarry products. That paper also touched upon depletion deductions, especially as to the bearing of these upon income taxes. While it is obvious that it would be impossible to adequately discuss such an important subject in a short paper, nevertheless I believe that sufficient was said to give, in a general way, the fundamental principles of valuation and depletion with their application to income taxes. I will, therefore, quote from the paper prepared last year for these matters and confine my present efforts to other pertinent features in connection with quarry operations.

It is assumed that all crushed stone operators as well as all other taxpayers, are interested in what deduction may be made from gross income in establishing net income. In other words, how much of their gross income is exempt from tax.

In addition to operating expenses, salaries, and such deductions as interest on borrowed money, insurance and losses due to bad debts reflecting the policy of administration and indirectly the management of the organization, the laws also provide for deductions having a direct bearing upon quarry operations.

These deductions are: Obsolescence, Depreciation, Repairs, Depletion, Losses from Sale of Capital Assets, Other Losses.

Obsolescence

Art. 143, Regulations 62, states: "When, through some change in business conditions, the usefulness in the business of some or all of the capital assets is suddenly terminated, so that the taxpayer discontinues the business or discards such assets permanently from use in such business, he may claim as a loss for the year in which he takes such action the difference between the cost, or, if acquired prior to March 1, 1913, fair market price or value as of that date of any assets so discarded (less any depreciation sustained and allowable as a deduction in computing net income) and its salvage value remaining."

Obsolescence means "no longer in use." A number of years ago, when small air hammer drills were first introduced, the company with which I was connected purchased several. These drills worked, but, being yet in an experimental stage, were found to use an excessive quantity of compressed air, and long before they were worn out were discarded to make way for newer and more efficient drills. Had income taxes with the present laws been in effect, we would have been permitted to write off the purchase price (with allowance for sustained depreciation), less salvage or junk value, as obsolescence. There are few instances in quarry operations where obsolescence be-

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comes a factor. The highly developed and tested equipment to be obtained today relieves most managers of the worry incidental to experimenting with new types of machinery and equipment. Nevertheless, it is a deduction and a quarry operator is as much entitled to his "obsolescence" as the operator in any other line of business.

Depreciation

Art. 161, Regulations 62 (1920 edition), defines the proper allowance for depreciation as "that amount which should be set aside for the taxable year in accordance with a consistent plan by which the aggregate of such amounts for the useful life of the property in the business will suffice, with the salvage value, at the end of such useful life to provide in place of the property its cost, or its value, as of March 1, 1913, if acquired by the taxpayer before that date."

Art. 224 (c), Regulations 62, states: "The estimated physical life of a plant or unit thereof (including buildings, machinery, apparatus, roads, railroads and other equipment and improvements whose principal use is in connection with the mining or treatment or other necessary handling of mineral products) may be defined as the estimated time such plant, or unit, when given proper care and repair, can be continued in use despite physical deterioration, decay, wear and tear."

Art. 224 (f), Regulations 62, states: "Nothing in these regulations shall be interpreted as meaning that the value of a mining plant and equipment may be reduced by depreciation deduction to a sum below the value of the salvage when the property shall become obsolete or shall have been abandoned for the purpose of mining. . . ."

Interpretation of A. R. 106-2/26/21 explained in Committee on Appeals and Review Memorandum dated July 6, 1921, page 292 of C. B. 5: "Many cases have been brought to the attention of the committee where corporations have been in existence for a long period of years, some of which corporations have been in existence several times the ordinary estimated life of the depreciable assets, and yet those assets are today in first-class condition and worth the figure at which they are carried on the books, although no depreciation has been charged as such and no additions to capital account have been made. In such cases it is obvious that depreciation has been adequately cared for by charges to expense. . . ."

Depreciation is a large question and there are many ramifications. In some instances it may prove a boomerang, for, if high depreciation has been assumed for several years and later the articles are sold at nearly the cost price, or, as has frequently happened (such as in real estate with buildings), above cost, the difference between the original purchase price less depreciation sustained and the selling price becomes profit and likewise income subject to tax.

The principle of depreciation is simply this: It is recognized that all machinery and equipment with reasonable care will last a certain number of years; some units will last short periods, and some, like the "one horse shay" year after year, one part as good as another, until, like Rover, "when they die, they die all over." Suppose you own a steam shovel having ample capacity for the work being done. With ordinary care this shovel should last about 11 years, which results in a rate of depreciation at 9.1 per cent, or in other words, 9.1 per cent of the original cost of the shovel is used up each year.

In January, 1919, for the convenience of the cement industry, a table of the average life of quarry and other machinery was approved by the government in an agreement with the Portland Cement

Association. This schedule was compiled after serious consideration by the parties interested and it is believed to reflect the actual working conditions of the class of machinery used in the crushed stone industry. A few items are given which apply to the cement industry only, such as dryers, kilns, etc., and they are included in this article as a matter of general interest.

The table is as follows:

MORTALITY TABLE OF QUARRY MACHINERY AND EQUIPMENT

Type of Equipment	Average Life. Years
Quarry Machinery and Equipment.	
Locomotives	13
Tracks and cars	9
Steam shovels	11
Dredges	11
Well drills	9
Tripod drills	7
Live stock	8
Carts and wagons	7
Cableways	9
Raw Department.	
Crushing machinery	14
Dryers, upright	11
Dryers, rotary	11
Slurry tanks	16
Grinding machinery	13
Clinker Department.	
Kiln, etc.	13
Coolers, upright	12
Coolers, rotary	13
Grinding machinery	12
Coal Preparing Department.	
Dryers,	11
Grinding machinery	14
Power, Light and Water.	
Engines	17
Boilers	15
Generators	16
Motors	14
Stock House.	
Packing, loading and sack handling	10
Machine, B. S. and Carpenter Shop.	
Machines and equipment	15
Mill Buildings.	
Concrete	50
Steel and iron	33
Steel and stucco	35
Steel and brick	40
Timber	20
General Buildings.	
Concrete	60
Steel and iron	40
Steel and stucco	45
Frame	30
Steel and brick	50
Frame and stucco	33
Dwellings.	
Concrete	60
Brick	60
Frame	30
Frame and stucco	33

A special request has been made for the announcement of the proper rate to be used for auto trucks and office equipment. As for the former it has been found impossible to outline a definite rate to be used for all trucks. Much depends not only upon the make of the truck but upon the service and use to which it is subjected. All operators can readily understand this.

Office equipment varies according to the articles. Usually, for the sort of equipment used around such industries as the crushed stone operations, 10 years would be acceptable. I persume it is not necessary to state that if any operators have offices sumptuously furnished with works of art, old masters and antiques (?) they may not claim any depreciation on these, as their value rests in their age and not in their service.

Upon first thought one would think that, since the acceptable life of the machinery is determined and the proper deduction to be used in his income tax return is evident, the rest is easy, and if his machinery cost, say, $30,000 and if it has a life of 10 years, all that remains for the taxpayer to do is to deduct $3000 each year for 10 years as depreciation. This is practically true if his machinery has been purchased subsequent to March 1, 1913; but few corporations have been organized so recently and many antedate this several years. With such operators, had the full rate of depreciation been used from acquisition, they would have written off, long ago, the full value of the equipment. Such a contingency is outlined in paragraph 6 of the Committee on Appeals and Review Memorandum quoted above. One instance is brought to mind where a taxpayer claimed a life of 50 years on wheelbarrows until the heaxy tax years, when he suddenly changed to two years' life. For just this reason the laws permit a readjustment of value as at March 1, 1913, for depreciation deductions, to the actual replacement, or sound value as at that time.

It was not intended that this March 1, 1913, value should be the cost of replacing the equipment with new units, but rather reflect the actual value as it stands, with due recognition to wear, tear, abuse, etc. The difficulty in properly judging the actual value and the confusion resulting in the minds of the taxpayers as to what data the department would accept in establishing this value has resulted in permission being given to submit appraisals covering depreciable items.

It must be noted, however, that what the March 1, 1913, value was, in any given case, is a question of fact to be established by the best evidence available, and that appraisals may or may not be the best evidence, depending upon the facts in the particular case. In the absence of a showing as to the March 1, 1913, value, the cost less depreciation to March 1, 1913, is the proper basis for determining that value. If an appraisal is submitted, to meet the requirements of the department, it must, among other things, consist of an inventory of all machinery and equipment units, date when purchased, cost, and reflect the depreciation resulting between the date of purchase and the basic date for which the true value is to be determined. The depreciation is the wear and tear to which the items have been subjected. The final result, as shown by the appraisal, does not necessarily have to show the value a purchaser would pay for the items if they were removed, for we well know that machinery sold after it has no particular use to the owner brings but little, but it must reflect the actual cost with proper recognition given to the wear and tear from usage. To elucidate: Suppose you have a considerable amount of piping in place; your plant and equipment is in use and so far as you can foretell it will continue as it is for several years; you know that the pipe in place is worth more than it would be removed, yet not worth as much as new pipe, for through rust, wear and tear it has depreciated to some extent. The appraisal should reflect these conditions and establish the value to you *in place* and *in use*.

It is not the purpose of this article to tell you how an appraisal is more, for this is technical work. I merely wish to state the points taken into consideration in establishing the values acceptable to the government by means of an appraisal.

Repairs to Machinery and Equipment

Closely related to depreciation comes repairs. In Committee on Appeals and Review Memorandum dated July 6, 1921, in paragraph 3, the statement is made . . . "that any action on the part of a particular taxpayer which extends the useful life of a depreciable asset beyond the normal or usual term, and any circumstance which serves to increase the salvage value of a depreciable asset, operates to justify a reduction in the normal rate of depreciation. The depreciation of an asset is arrested where it is maintained at a high standard of efficiency either by the exercise of unusual care in its use or by unusual maintenance expenditures." In other words, if you keep your machinery in first class condition through unusual repairs so that it is practically as good as new, your rate of depreciation should be reduced.

In my own experience I have used rock crushers more than 20 years old, boilers and motors more than 25 years old, all going strong. It is true that the crushers had little to identify the original article aside from the frame, the jaws, toggles, springs and such parts having been replaced many times, as well as the babbitt in the bearings innumerable times, and every part of the boiler having been replaced except the shell and the outside brick walls; the motors had been rewound and many new brushes replaced as well as a new commutator, but to all intents and purposes the same articles were still in use. I also recall a rock drill that had been entirely replaced piece by piece in three years' time, yet the original drill apparently was there at the end of that period.

It is obvious therefore that depreciation and repairs are linked inseparably. The ideal condition would be to have the parts of every machine made uniformly strong, but this is never met with in actual experience. It therefore becomes necessary to analyze the actual working conditions in order to differentiate between the proper deductions to be made for repairs and for depreciation. In keeping the books it is necessary to have what is known as the "capital account." To this account should be charged such items as will have a con- least more than one year. Those items tinuous use for a period of years, or at

which constitute the replacement of the wearing parts, designated as repairs, are charged to the "repair account," and these items become deductions in the year in which they are used. Also, if these wearing parts are purchased in quantity and a sufficient supply is accumulated to last more than one year, they are all placed in the capital account, and as they are used, they are charged to the repair account.

From the foregoing statements it is evident that a large depreciation and a large repair account for the same units are not concordant. Either repairs may be heavy and depreciation light, or depreciation may be the maximum rate permitted and the repairs practically negligible save for the wearing parts, such as the rock crusher jaws or the babbitt in the bearings.

I well realize that in a short paper it is impossible to fully cover the subject as it effects each individual, but by outlining the principles each one can apply them as they affect his personal requirements. It becomes quite evident why Uncle Sam must have his "army of clerks" in Washington to review the accounts as submitted by the taxpayers; it is also obvious why clerks, who have had practical experience along the lines of business conducted by the taxpayers, have been selected, assuring an intelligent review of the returns. For one who has never had to order repair parts months ahead in anticipation of the time they will be needed, and where a few days delay in obtaining the parts may force a shut-down of the plant with the overhead eating up the year's profits, it is difficult for him to realize the importance of the "repair" account and differentiate between the inseparable sisters, depreciation and repairs.

*Depletion**

You all know that March 1, 1913, was adopted as the basic date for establishing valuations for depletion purposes and also to determine the profit or loss in selling or disposing of your capital assets. You also know that the unit rate of depletion is determined by dividing the market value of the property at that date, if acquired prior thereto (or the cost if acquired subsequently), by the number of units contained in the deposit. You also are aware that a leasehold has no value for establishing depletion above the bonus paid for it.

It is evident that the correct determination of the March 1, 1913, value of the property is of major importance in computing the tax due the government. The regulations say that an appraisal made at that time, if consisting of a real appraisal and not merely an expression of opinion, shall be given due consideration. Since few were made at that time, and both the taxpayers and the government realized the necessity of having one, the laws provide for appraisals reflecting conditions known to exist as at that date, and establishing the true market value, or such a value as a willing purchaser would pay a willing seller for the property, this "market value" reflecting the "cost of replacement" value as at that time.

There has been so much misunderstanding as to just what is meant by an "appraisal," and since this feature is a little different in connection with your line of operations than in some other lines of industry, I will endeavor to explain to you the meaning of the term.

Appraisals—An Example of a Limestone Deposit

Not long ago a representative of a large brokerage concern said his house was contemplating putting a large issue of bonds on the market for a successful limestone company that desired to increase its output. The proceeds from the sale of bonds was intended to provide additional plant, equipment and shipping facilities. He stated that his house has always been conservative and hesitated to place any bonds unless they were assured that the company owned assets which at a forced sale would amply protect the bondholders. Two prominent engineers had made appraisals of the limestone deposit, and on account of the exceptional purity of the limestone they had both agreed that the deposit was worth at least 10 cents per ton in place.

The deposit being large, represented more than a million dollars in value. While he recognized the good faith of the engineers, he was not quite satisfied with the accuracy of their reports, so he came to Washington. Before he came in to see me he had consulted two other engineers in this city, who had placed values of 10 cents and 25 cents per ton on the limestone, calculated from his figures representing the profits of the company in question.

This man being ultra-conservative, still was not satisfied, and in placing the proposition before me asked me to tell him what I, as an engineer, would report in such a matter.

It must be borne in mind that the name of the company or its location was not mentioned. Had he told me either, I should not have been at liberty to discuss it with him, but since I could advise him in a general way, I was glad to do so. I therefore outlined to him much in the following manner just what I as an engineer would do had I been consulted in the matter.

Estimating the Value of Limestone in Place

I told him the statement that limestone is worth 10 cents per ton meant nothing unless supported by substantiating figures, which any other engineer could check and approve. It is the duty of the engineer to investigate the business. The first thing would be to ascertain whether the company had acquired all the limestone available in that district. The next, to see if the market would justify an expansion of the business. This would have to be done by establishing the extreme limits for shipping the product without trespassing upon his competitor's territory. It would then be an easy matter to estimate the market requirements for his district, and a reasonably safe percentage could be allowed for growth in population.

The next step would be to check up the profits of the company and estimate the cost of operations to be expected from an increased production of material. Then, by properly analyzing all these factors, it could be very easily determined whether the contemplated issue of bonds would be justified. As for the value of limestone, I told him it had no value more than the cost of the raw land, or at the most the developed quarry. For example: "Suppose the company failed, and you were depending upon selling the 'quick' assets, what would you expect to realize from your mountain of limestone?" He replied, "We would be lucky to get $5000 for it."

He was quite disturbed over this logical conclusion, and remarked: "Well, then, I don't see how my house can recommend the sale of those bonds." I then hastened to tell him that if an engineer would make a favorable report under these conditions, he would not only be perfectly safe in handling the bonds, but infinitely better off than to accept the basis previously outlined to him, I, personally, would not hesitate to invest all the money I have in a sound business with such a report by a reputable engineer.

Another man came to me with an entirely different proposition. This one was a somewhat smaller undertaking, but since the deposit was large and had an apparent life of many years, with the usual promise of expansion, he asked me what value I would place on the property, as he contemplated purchasing it.

Again I knew nothing whatever of the name of the company or its location. (I may add right here, that in the illustrations I use, I am not alluding to any particular properties with these two exceptions.) My visitor stated that the company had shown a net income of about $20,000 a year. I learned that this was not the only deposit available in that territory, but there were numerous others operating in competition, and any amount of ground was to be had at a very small price per acre, with every promise of being fully as good as the one in question.

I told him that while this property represented a "going concern," and had an admitted value, he could not afford to pay the owners more than $80,000 for the entire business, not including the plant and equipment. (The plant and equipment could be appraised for what they would be worth to him.)

My suggestion was somewhat of a surprise, for the price proposed was very much in excess of this figure. I further suggested that rather than pay in excess of $80,000 it would be advisable to purchase some of the cheap land adjoining, and use that amount in developing the new quarry and establishing his own business.

One more illustration: Suppose a big company purchased a property for $2,000,000, then had to put a plant and equipment on it costing another $4,000,000. They are able to pay $250,000 a year in dividends. It will take at least 40 years to exhaust the supply of raw material. At first sight, this would appear to be a good investment, but in reality it is a very poor one, for the same amount of money at compound interest would return as much, with no worries incidental to conducting the business and with no risk.

These illustrations are given to outline in a way what is meant when the government uses the term "market value."

Leasehold

Just one example to explain why a leasehold has no more value for income tax purposes than the bonus paid for it. Suppose one of you owned a leasehold running for 10 years on which you are paying 3 cents per ton royalty, and are making 20 cents per ton profit (profit meaning in this case the income before deducting depletion and depreciation). As lessee you do not own the mineral; you have merely the privilege to extract it. This leasehold costs you nothing, and you have a reasonable assurance that you will have extensions of time at the expiration of the 10-year period, and you consider this leasehold to have a real value to you.

*This part of the paper consists of extracts from a paper on this subject delivered at the annual convention of the National Sand and Gravel Association at Washington, D. C., January 24, 1923. Printed in full in Rock Products, February 10, 1923, pp. 30-33.

Suppose you estimated this value to be $100,000, and, based on your output, some engineer has so computed it. If this value were established, you would be entitled to amortize this leasehold through the 10-year period, at the rate of $10,000 a year. If this reflected 10 cents per ton on your output, you would be writing off 13 cents per ton (amortization plus royalty) as a tax-free deduction. By the time your depreciation and other permissible deductions had been written off, you would have very little income left on which to pay taxes. This would be manifestly unfair not only to the government but to the ones who owned the fee title to the property as well.

The chances are that the lessor who owned the property would not be entitled to write off more than 1 cent per ton as depletion, the remaining 2 cents from the royalty representing the profit to be reported on his returns. Therefore, it would be entirely unjust to allow the lessee such a deduction on his returns.

It is very doubtful whether an engineer would report the advisability of one purchasing the leasehold at that figure. If someone did purchase it, the seller would be expected to report the entire amount received as profit in the transaction. The purchaser then in that event would be entitled to the price paid as a valuation, for the purchase price would represent bonus paid for the lease.

Royalty

A few words relative to the bearing that royalties have to the value of deposits: While it is recognized that leases are given requiring a unit rate of royalty, these in no wise reflect the value of the deposit. As explained before, the unit value is determined by dividing the cost of the property, or its market value by the number of tons contained therein, while royalties are determined by the amount a lessee is willing to pay a lessor for the privilege of entering into temporary possession of the premises and removing the material.

It is obvious that the lessor will not permit anyone to remove the material at the actual cost of the product. He will, naturally, expect some compensation for the damage which may be done to the premises and to have a profit remaining in the transaction.

The amount of royalty paid is usually a matter of adjustment and agreement between the lessor and lessee and factors enter into the deal that have no bearing on the actual value of the deposit in place. Where numerous leases have been given in a certain district all running uniformly, and these have been the result of many years' adjustments between lessors and lessess, they may be accepted as indicative of what the value of the product is, by making the proper allowances for profit and the damages to the land resulting from the removal of the natural resources. Even so, however, the engineer accepting these values will do so with proper reservations, and will prefer to check the results with transactions of as nearly parallel conditions as possible, where an actual bona-fide deal has been made reflecting the true unit value of the deposit.

Management and Contracts

Good management and favorable conditions also enter into consideration in determining the value of a "going business." Suppose that you and I each put in $10,000 to buy a sand and gravel pit. We are able to obtain favorable contracts (and deliver the goods, for we will use trucks and not depend upon freight cars), and we clean up $100,000 the first year, with a possibility of having many such years repeated.

If someone wished to buy us out, it is safe to say that we would not sell him our business for the $20,000 we have invested in the sand and gravel, but would expect much more than that. However, supposing there are other deposits available, we are not entitled to any more for depletion than was represented in the original cost. In this case it is not the sand and gravel that gives the selling value, but the contracts we hold and our business ability which forestall competition.

Discounted Earnings

I believe with the few illustrations noted you will have an idea of what is involved in valuations for income tax purposes. Since undoubtedly you have all been advised that the government at times permits the so-called "discounted earnings" method of valuing deposits, I will outline briefly what is meant by the term, and also explain why it is not applicable to such deposits as sand and gravel and quarries.

The "discounted earnings" method is intended to reflect the price which one could pay for a proposition, and be assured of having a proper return of his money distributed over the life of the property, the money thus received to be placed in a sinking fund drawing 4 per cent interest. In other words, we as engineers would resort to this method if no other way presented itself to be able to say what value a property would have to a probable purchaser to represent a good investment.

The first consideration would be, what rate of interest should we expect for the money invested? This is also known as the risk rate, for the risk or hazard in the operation would determine what we should expect from the investment. For instance, if we contemplated an investment in an underground mine, with a deep shaft, danger of caves and fire, we would undoubtedly expect a higher rate of interest on our money for taking the risk incident to such an operation than from operating a sand and gravel deposit consisting of outside work, with no definite hazard. For sand and gravel we would expect 10 per cent.

Then, estimating the number of tons of material we would produce in the operating life of the property, and knowing the profit per ton, we very readily ascertain the entire profit anticipated from the business. By means of Hoskold's Tables, adopted by the government, the amount of money which would return the rate of interest decided upon, together with the interest accumulated from the sinking fund compounded annually at 4 per cent, is easily determined. This amount represents the sum of money which we could place in a bank under the same interest conditions to produce a like result.

There is another factor to be considered; that is the plant and equipment necessary to carry on the operations constituting an additional investment. Obviously, the money tied up in these has to be returned in the same way, so before any allocation is made to mineral the price of this equipment has to be deducted from the amount. In case of long life of the property, the value of plant and equipment may be multiplied three or four times through replacement and depreciation, so in considering the proposition from an investment standpoint it becomes necessary to deduct the multiplied value of the plant and equipment.

It is surprising how many times this method results in no value at all for mineral, when the computations are carried through properly. This is principally due to the small unit profit and to the long life of the deposit in such operations as sand and gravel and limestone.

Discounted earnings is purely a speculative method, and where properties are being purchased nearly every day, and farm land values usually attach, it is not difficult to determine about what the market value is without resorting to such theoretical methods. Again, one company making exceptional profits, due to business ability, favorable contracts or other factors, may make a larger per unit profit and be benefited accordingly, which would place his struggling competitor at a disadvantage, while the market value of the sand and gravel deposit would be the same.

In mines producing the rarer materials where the deposit is limited, this method is much more satisfactory. In these cases, as a rule, the life of the property is comparatively short; there are not so many renewals of of plant and equipment; the prices are more fixed; the sale of the product assured, and uncertainties do not creep into it as in the sand and gravel business and several other of the non-metal industries.

Manufacturing Industries

The foregoing remarks apply to natural resources that have a market value as they are removed. In a few industries—cement, gypsum, stoneware, brick and tiling—the market value lies in the manufactured product. The prices received for the finished articles (having to include the cost of the manufacturing process) are out of proportion to the value of the raw material from which they are made. Obviously, the discounted earning method could not be applied to these industries unless due allowance is made for manufacturing.

As one engineer aptly expressed it, "One could no more discount the earnings from a manufacturing industry, to determine the value of the clay from which the articles are made, than he could discount the profit from the sale of shoes to determine the value of the cowhide."

Discovery Value

Discovery implies "surprise," and is intended to apply to such things as encountering oil or some mineral the presence of which was absolutely unknown. It would not be recognized as a discovery when a sand and gravel company purchases adjoining land and then "finds" sand and gravel on the property. It is assumed this was known before the deal was made, and surprise would have resulted had the sand and gravel *not* been "discovered."

While I have endeavored in this article to touch upon the "high points" concerning valuations as applied to income tax, it is evident that there are many other items to be considered, and many factors that enter therein. No two cases are exactly the same. Jones and Brown may be neighbors in the same line of business, but when the returns come in Jones may have a comparatively simple case which is quickly adjusted, while Brown may have so many ramifications that it would be difficult to believe they were even in the same country. From the few complexities I have mentioned I am sure you will agree with me that Uncle Sam has a real job in adjusting the income tax and needs his "army of hawk-eyed clerks."

What Is an Appraisal?

And now, to epitomize, we find that an aggregation of logical data, establishing the investment value of any proposition, is an appraisal. A mere statement that a deposit is worth a certain sum of money would not suffice. The government engineers are placed in the same position in reviewing income tax returns as they would be were they

called upon to appraise a contemplated investment. The sum that one can conscientiously report to such a principal would be the amount recommended as the market value of the property, or that sum which a "willing purchaser would pay a willing seller." It may be a surprise to you members to learn that in every case handled by the government an appraisal has been made of your property, and when your claims have been allowed, where the valuation has had to be determined by theoretical methods (I mean by this where the payment was not made in cash), it may be some satisfaction to you to know that your business has justified the valuation approved as reflecting a fair investment value.

The government has adjusted thousands of cases, and the statistical information obtained is invaluable. It may interest you to know that for all the non-metals produced in the United States consisting of about 150 different natural resources, the average depletion deduction amounts to a trifle less than 2 per cent of the gross income. That is, the cost value of the natural resources is about 2 per cent of the selling price. The average cost value of some of the natural resources follow:

	Per Ton
Limestone	1c
Gypsum	3c
Sand and gravel	1 to 1½c
Fireclay, for refractory brick	3 to 6c
Clay, for brick and tiling	½ to 2½c
Glass sand, the best grades, about	6c
Molding sand	2 to 10c
	Cu. ft.
Monumental stones, marble and granite for the finished or dressed product	3 to 5c

Such non-metals as magnesite, feldspar, fluorspar and sulphur, due to their scarcity, have greater values.

Salt has very little value in nature. Under the state of Michigan it has been estimated that there is enough salt to supply this country for 100,000,000 of years. One deposit was found to be 2400 ft. thick and of unknown area when the drilling stopped. (This last not in Michigan.) Contrary to the popular belief that the ocean is the source of all salt deposits, the converse is true, and the salt deposits furnish the salt for the ocean.

Exceptional Cases of High Valuations

Of course there are exceptions to all rules. One place where a smelter is operating it procures the limestone necessary for its flux from a distance of more than 100 miles. In this locality a small deposit of suitable limestone was discovered and it actually cost 25 cents per ton, but was soon exhausted. The statement has been made that limestone in this locality is worth 25 cents per ton in place. It is in fact, if a deposit could be found, it could be sold for 50 cents per ton in place, for even then it would be much cheaper than paying freight.

I have actually paid $6.40 per cubic yard for suitable sand for concreting in one of the Western states. Needless to say, the sand producer received a very small part of that $6.40; most of it went for freight. I mention these facts to illustrate that the government does not apply one fixed value to all deposits. Most of the non-metals have small value in nature because where they do occur they are usually in large quantities.

Possible Standardization of Tax Rates

There is one plan by which I feel that Uncle Sam might eliminate, to a large extent, his "army of clerks" in collecting tax, and some day I hope it may be tried. It would not be difficult to compile, from the thousands of cases already adjusted, a proper rate of tax to be taken on the gross income for each line of business. For you members I think I could tell you, were I permitted, just what percentage of your gross income would be a fair tax, and this would represent the entire industry with all due allowances made for depreciation, depletion, taxes, etc., taken into consideration.

I can imagine with what gratitude you would greet such a statement. It would be an easy matter to adjust your prices at the beginning of the year and your troubles would be over so far as income tax is concerned; this would also save the government much money in keeping this "army" in Washington.

As many of you know, the closing paragraph for letters adopted by the department begins as follows: "As it is desirable to dispose of your case at an early date." Tradition has it that once a letter was mailed reading: "As it is desirable to dispose of your *cash* at an early date," etc. The impression seems to be that the government as a veritable ogre, sits on its throne in Washington with outstretched hands ready to grasp the shekels from the unwary and overburdened taxpayer to satisfy its insatiable demand for money. The facts are, the war must be paid for, the income tax is an established reality and the levy must be impartially made upon all. The minions of the government, represented by this "army of clerks," are merely endeavoring to see that the laws are equitably adjudicated.

When all is said and done, the taxpayers constitute the government, and the "clerks" are representing you. As far as I know, not one employe has ever felt that it was incumbent upon him to resort to nefarious practices in determining tax liability. It is the desire of the government, and therefore its employes, to adjust the taxes fairly and honestly for all.

General Principles Involved

The principles of valuation and the methods of determining depletion deductions are the same for all natural resources. The valuation accepted by the government, as outlined in the previous paper, is such an amount as a "willing buyer would pay a willing seller," which in the final analysis means the sum one person would pay another for his mineral (any natural resource) in place, and be assured of having a good investment.

Depletion is determined by dividing the value by the number of units contained in the deposit, the rate of depletion applying to each unit when sold. Any slate, marble or granite blocks removed from the quarry and not sold are included in the inventory at the end of the year, but depletion cannot be deducted on income tax returns until the product is sold, when it applies directly as a deduction from the gross income.

Because of the method of determining the rate of depletion, it is obvious that a uniform rate cannot be applied to any of these industries. There is nothing more uncertain than the quantity of marketable material which may be recovered from such quarries. The uncertainties to be considered are:

The amount of waste to be removed to recover marketable material;
Uniformity of texture of the suitable material;
Uniformity of color, and
Mining conditions.

Mining conditions are controlled by depth of overburden and the geological formation of the deposit. We have all seen ledges of these materials standing nearly on edge, but with such a dip that the depth of operation is limited to that point where the hanging wall becomes dangerous and further progress is arrested. It is out of the question to timber such places as may be resorted to in mining the more valuable minerals, due to the comparatively low selling price of the product and the high cost of timber. For these reasons one operator may have a high rate of depletion and his neighbor with more favorable conditions may have a relatively small rate.

As yet, the slate business is particularly unfortunate in having developed no way of utilizing the "fines" resulting from mining. There is a limited demand for slate granules but the small quantity thus disposed of is practically negligible compared to what could be done. The rest of the fines are all wasted. In this respect, the marble and granite industries are slightly better, for some concerns burn their waste marble into lime, and some of the granite companies dispose of their waste, after crushing, as road material.

Even after mining suitable blocks of these materials, the operator is confronted with a tremendous wastage in the milling. Records show that the percentage of finished product to the mill blocks runs from 42 to 90 per cent. It is in this milling stage that the texture and color become factors.

All these things have to be thoroughly considered before a valuation can be given to a property. It is surely heart rending to use up these large deposits, realizing that when the final product is placed upon the market only 10 per cent of the material removed becomes commercial. Such is the case with many operators, and those who are able to utilize all the material extracted are particularly fortunate.

The unit cost values of these minerals in place have been shown as follows:

Slate:
- Shingles — From $.054 to $.345 per square, with the average less than $.25.
- Blackboards and Billiard Table Tops—From $.006 to $.012 per square foot.
- Electrical—From $.006 to $.023 per cubic foot.
- Structural—From $.006 to $.008 per square foot.
- Mill Blocks, sold before dressing—From $.012 to $.0145 per cubic foot.

Marble:
- Building and Ornamental—From $.02 to $.06 per cubic foot. Average is less than $.05.

Granite:
- Building and Ornamental*—From $.03 to $.10 per cubic foot.
- Paving Block—From $.30 to $1.40 per M.

*Average less than $.05 per cubic foot.

Street Curbing—From $.01 to $.03 per lineal foot.

Loss in Sale of Capital Assets

While I am mentioning "loss," the word "profit" may enter in. I am sure you are all more interested in the word loss, for this becomes a direct deduction and nullifies an equal amount of gross income, thereby permitting it to become exempt from tax. Profit becomes a tax assessment item. At first thought, if you bought a piece of machinery 10 years ago for $5000, and you should sell it for $4000, you might figure you had a loss of $1000. According to the interpretation of the regulations, it might surprise you to be told that you had made a handsome profit in the deal. I am mentioning one unit of machinery, but a complete plant or mill is made up of separate units, and in determining the profit or loss in selling the entire equipment, the method consists in ascertaining the profit or loss on each unit and aggregating the whole into one amount.

In determining the profit or loss, the history as reflected in the annual income tax returns is followed from the acquisition.

Cost or the value at March 1, 1913 (if acquired prior to that date and the value at that time is *less* than cost), is the starting point for determining a loss.

Cost or the value at March 1, 1913 (if acquired prior to that date and the value at that time is *more* than cost), is the starting point for determining a profit.

The various amounts of annual depreciation with proper recognition of the capital additions and depreciation accumulated upon the additions are all deducted from the cost or March 1, 1913, value, as the case may be, and the result reflects the profit or loss. If a taxpayer has taken deductions as depreciation, amounting to the original cost of the articles, he has had returned to him, tax exempt, all that he is entitled to and every cent paid in at the time of the sale represents profit. The amount received therefore should be reported as income on which he assumes tax liability. If, on the other hand, he receives less than the above amount, with the sustained depreciation deducted, he is entitled to report the difference between the selling price and this figure as a loss.

In those cases where a property has been operated showing a depletion of the natural resource, and a sale is made of the mineral land, the same principles apply in determining the profit or loss as in the physical assets, except depreciation becomes depletion.

Other Losses

There are other losses that may be written off. I know of one case where a new steam shovel was purchased which proved too small for the work intended. The company endeavored to use it with the result that at the end of the second season it had no value as a steam shovel and was discarded. Several attempts were made to sell it without success. At the end of the second season the shovel was junked, bringing in merely a nominal amount as salvage or scrap value. This company had the right to write off as a loss, computed by deducting from the original cost, the depreciation of the two years, with the salvage price received and reporting the difference as a loss in that year.

Many plants are erected with the impression that a large body of suitable stone or clay is available and after a short period of operation find that the natural resource is exhausted and it becomes necessary to discontinue work and salvage the assets. In this case as well, the final loss determined as above outlined is an allowable deduction and may be written off in the year in which it accrues.

The cost of a machine proving inefficient and replaced by a better type, with due recognition of sustained depreciation and salvage value, may be written off as a "loss of useful life." This term is synonymous with obsolescence.

A body of suitable stone or clay or other natural resource may become exhausted (and the cost March 1, 1913, value has not been recovered through depletion), but other material may be available and the plant and machinery continue in use. In this case, a loss may be claimed on the natural resource, calculated as indicated above, but no loss can be claimed on the plant and equipment until they are actually discarded. A taxpayer may also write off any losses arising from fires, storms, shipwrecks or other casualty or theft. After outlining the basis of computing the losses, which are similar to those in the sale of capital assets, outlined in a preceding paragraph, Regulations 62, Art. 141, states, "In any event the loss should be reduced by the amount of any insurance or other compensation received."

Supplementing the above, Art. 141 also states: "A loss on the sale of residential property is not deductible unless the property was purchased or constructed by the taxpayer with a view to its subsequent sale for pecuniary profit." Also, "Where a person gives away property, or is divested thereof by death, no realization of loss results therefrom." Art. 142 states a matter of interest in "When a taxpayer buys real estate upon which is located a building which he proceeds to raze with a view to erecting thereon another building, it will be considered that the taxpayer has sustained no deductible loss by reason of the demoltion of the old building, and no deductible expense on account of the cost of such removal, the value of the real estate, exclusive of old improvements, being presumably equal to the purchase price of the land and building plus the cost of removing the useless building."

In General

The various laws or acts passed by Congress enacting the income tax laws constitute very small volumes; whole libraries have been written interpreting them. The principles involved are not many and are easily outlined. Each taxpayer presents his statements according to his interpretation. It is no wonder that many irregularities are found upon review in Washington. A taxpayer does not have time to make a complete study of all the points involved, and if he did it would prove of little value to him, for each one has a problem of his own and very seldom are two alike. It is not the intention of this paper to cover all "ins and outs" connected with filing income tax returns, but to present the different features in such a way that the members of this association may understand their rights and prerogatives, and in a general way outline their limitations as well. A story is told of the taxpayer who, returning home from a visit to Washington in connection with tax matters, was asked how much he had succeeded in having his assessment reduced replied, "Not as much as I thought I would, and I didn't think I would." After 10 years or more of facing income taxes, the public in general is very well informed. Personally, I feel that very little can be said which is not already known.

The most important thing of all, is to supply full and substantiating information. In many cases the income tax blanks are not large enough to carry all the data needed, where it is found that space is lacking, do not hesitate to attach as many pages as are needed. The department issues forms for filing information in connection with natural resources which may be obtained upon application. If in doubt about any matter, write to the department, addressing your communication to the Commissioner of Internal Revenue and it will be promptly attended to. If it is not convenient to write, drop in yourself, or have a representative of your association do so for you. The department always welcomes any means of giving information. Anyone asking for general information can obtain it and there is no danger of his seeing your individual returns or ascertaining your tax liability unless he has a properly executed power of attorney from you, as well as being a properly enrolled agent with permission to appear before the bureau on income tax matters granting him this privilege. One thing of great importance is to reply promptly to any communication from the department. When this point was particularly impressed upon one taxpayer recently he replied, "Your letter received today; I would have answered sooner if I had received it before." Don't consider it a useless imposition and ignore it, or several months later you may be confronted with a heavy tax assessment due to the department having to act upon what information is at hand.

In conclusion I wish to express my appreciation to the following gentlemen who kindly consented to the presentation of this paper:

Hon. D. H. Blair, commissioner of internal revenue.

Hon. J. G. Bright, deputy commissioner.

Mr. S. M. Greenidge, head, engineering division.

Remarks on Depreciation

CHAIRMAN SCHMIDT: The first subject to be discussed this morning is the paper which I spoke to you about last evening. "Depletion, Depreciation, Obsolescence, Repair Account, etc., in Connection with Income Tax Reports," by C. C. Griggs, Assistant Head, Engineering Division, Office of the Commissioner of Internal Revenue, U. S. Treasury Department. The gentleman who prepared the paper is unable to be with us.

When this paper is finally printed in the official transactions it will cover the points that you are asking, that you are uncertain about, unless they have already been explained here. There is a whole lot of explanation in this paper.

There is a supply of these reports here for every one desiring them. The first subject in the paper is "Obsolescence." Is this explicit enough? Is there any further information that we want to ask Mr. Griggs on that?

The next subject is "Depletion;" "Repairs to Machinery and Equipment;" "Depletion," on the question of "Appraisals;" "Estimating the Value of Limestone in Place;" "Leasehold;" "Royalty;" "Management and Contracts;" "Discounted Earnings." These are only the headings. If there is any one point that you want to get further light on now is the time to make it known. "Manufacturing Industries;" "Discovery Value," if you find gold on your property what can you do with it; What is an appraisement? That is an interesting paper. Is there any discussion?

MR. MAGRATH: My only thought about this matter is whether there could not be some short cut, instead of involving so much expense in accounting. The difficulty in our line, is the expense in accounting to take care of all this in the detail called for by this paper.

For instance, this bulletin gives some 20 or 30 different items of machinery. That means a ledger account for every piece of machinery and its various parts. I have been trying to persuade the government to let us treat the whole proposition as one unit that has a certain life. The difference between its costs, such additions as may be made throughout its life, less its salvage value is the amount to be charged per annum. You can charge it off per ton or per year, any way you see fit. If you use this method, it will save all this trouble and everything that is involved, but I have not been able to make the government see it this way.

I would like to ask Mr. Rice if he has any rough figures in his mind that he could use in that connection, in regard to what he said about making up accounts and carrying a ledger and estimating its life. He said that it meant a vast amount of accounting work and the cost of it is considerable. I cannot see where it is necessary at all. I am interested to know what figures he would consider.

"Unit" Method of Depreciation

MR. RICE: I have had a great deal of correspondence with the government on this question of depreciation. The government has endeavored to get us to approach this position from the standpoint of depreciation on various buildings and machinery, depletion with reference to the exhaustion of the quarry, together with obsolescence and amortization.

We have, however, endeavored to cling to the theory that amortization is the principal and practically the sole consideration insofar as it applies to our business. We recognize the possibility of dividing all the various capital items and treating each one of them separately with different periods of life, but it seems to us that this needs an amount of accounting locally at the quarry by keeping a ledger account with every separate item, and that it is an extremely expensive and no more illuminating process than to treat the quarry as a whole.

We have therefore gone on the theory that the difference between the original cost of the operation, less its scrap or salvage value at the end of its life, represents an amount of money which is necessarily chargable against the amount of work done throughout the period of operation. This period of operation is, of course, the life of the quarry. Consequently, the amount of money referred to divided by the number of years of life would represent the annual depreciation, or amortization, or whatever word you chose to use to describe the account.

It may be contended that the life is a very uncertain question, but it is of course quite as good as any other guess and can be modified from time to time as experience sheds more light. It so happened that after an experience of about 25 years with a dozen or more quarries we would have arrived at the same result had we from the beginning deducted 5% annually of our total investment, continuing this process each year up to the present time. When I say deduct 5% I mean writing down each year the value of the plant by that amount and in the second year 5% of the written-down price; in other words, taking 95% each year of the value as remains after making the deduction.

This, however, would be an insufficient amount in the event of there being only one quarry for consideration, because the average life of 10 or 12 quarries would naturally be different from the life of one; and it would appear from calculations I have made that 7% or 8% would be more nearly correct for a single quarry than 5%. As a matter of fact, 7% would retire the investment in 20 years, leaving a 23% salvage; in 25 years, leaving 16%; in 30 years, leaving 11%. Eight per cent would retire the investment in 20 years, leaving 19%; in 25 years, leaving 12%; in 30 years, leaving 8%. As a broad proposition, it would seem as though the average life of a quarry was about 20 to 25 years and that there would be a salvage of about 20%, which checks up approximately with the foregoing figures.

It would be of very considerable interest in the consideration of this question if we had the information from every operator here as to the life of all the quarries he happens to know of. This would probably give us a record of perhaps 500 quarries, and I am inclined to think that the average life of them would not exceed the 20 years I have stated.

Of course, each quarry is a fact unto itself, but if the government would accept my thought in the matter the average of 500 would be a fair basis to start on, the rate to be modified according to the individual quarry. The principle would save a tremendous amount of detailed accounting and I believe be more nearly correct in the final analysis than attempting to enter into the detail which is such a percentage on a frame building, another one on a brick building, another on a crusher of one type, another on a crusher of another type, different percentages for steam shovels, locomotives, cars and all the other classes of equipment which is part of a quarry installation. To do all this detail accurately is a tremendous undertaking and in the last analysis the whole principle of amortization is the treating of capital as a suspended operating expense, which must be charged off during the life of the operation regardless of the detail method in which the expense is allocated to each year.

MR. MAGRATH: What does that 5% cover?

MR. RICE: That 5% covers absolutely everything. If you bought a wheel and you had something left at the end of that time, that is everything you have.

MR. MAGRATH: Do you think 5% is too much?

MR. RICE: Theoretically and honestly, I am trying to do just what my best judgment tells me in my own interests. We will charge that off during the life of the property.

MR. A. M. ANDREW: A year or two ago a member of the Sand and Gravel Association stated before its convention that he had succeeded in making the government allow them 10% a year on equipment and 5% a year on building. The way I figured it was that in 10 years' time he has paid for all, unless he has made additions to his plant. I do not see how it could be done.

CHAIRMAN SCHMIDT: That is not possible. When your plant is charged off, you get no further allowance from depreciation. That is explained in this paper, and a good many of these things are gone into more or less in detail.

Salesmanship Discussed by Crushed Stone Salesmen

Luncheon Held on January 21, 1924

THE meeting convened at 1:45 o'clock, H. H. Brandon, of Piqua, Ohio, presiding.

CHAIRMAN BRANDON: We are marking a new era in the crushed-stone business. To the best of my knowledge this is the first attempt to organize co-operation among the salesmen representing the crushed-stone industry in the United States. We cannot attempt in the few minutes this noon hour to go into salesmanship and all of its ramifications. We are approaching a subject that has no beginning and no end. We are approaching a subject more complex than life itself. In fact, life is but a term of salesmanship. An infant begins its life as a salesman, selling itself to its mother, father, and friends through the great medium of love. The youth must sell himself confidence, enthusiasm in the future, and the ability to retain his stand among people. On the death bed we must sell love, honor, and respect to those who follow us.

The lowest laborer in our quarry must sell his labor and personality to his superiors. However, we bring ourselves back to organization of salesmen. We have a specified commodity to dispose of to those people who can use it.

In the crushed stone industry, I believe it is a recognized fact that up to the present, the problem has been largely one of production rather than distribution or salesmanship.

It has only been within the past year or two that the fathers of this business have been forced to give salesmanship the consideration that it rightly deserves.

One thought that occurred to me a year or two ago and caused me to make a little investigation in Ohio and Indiana resulted in this fact: I found that the rate of compensation paid the average operating man when taken into the industry was approximately 20% greater than the salesman. That indicated to me two things. One of them was that the owner considered the operation of his plant of greater importance than distribution of his product. Second, it indicated to me that the superintendent was of a higher type of man than the salesman.

I think, however, that condition has remedied itself to a greater or less extent within the last few years, because of the economic conditions of the nation, and because of varieties of products which require salesmanship of a higher type.

Advertising

Promotional advertising enters into a complete, full distribution of the product. A few years ago, at a meeting of this association at Chicago, 15 minutes' time was allotted to salesmanship papers. One year ago, perhaps, an hour was allowed. I think that was the exact time allotted, but because of the encroachment of another paper, our time was cut down to 45 minutes. We did not get anywhere with it, but at this meeting, salesmanship has grown to the extent that the suggestion has come from the fathers of our industry that we combine two noon day luncheons and make room for a salesmanship luncheon.

Harry H. Brandon

I believe that within the last two or three years salesmanship has advanced more rapidly than the rest of the industry. I believe that because of this meeting we are going to be able to pass resolutions insisting that at least a one-half day of our N. C. S. A. program being devoted next year to salesmanship.

In talking over the proposed program for this salesmen's meeting with some of my friends we find that the ramifications of the crushed stone industry are wide. We also find that salesmanship is to a more or less degree a local proposition. We have one gentleman who sells the city of Chicago, a well organized market. In our own business we are selling in small towns, a comparatively unorganized market, scattered over a large territory, radiating from our plants miles and miles, up to as high as 200 miles, and some specialty products limited in distribution only by the boundaries of the United States. We have a wide variation.

It would be useless for us to go into the question of salesmanship in the crushed stone industry; it is suggested that we consider just a few things in a more or less general way, primarily advertising, promotion and sales.

Purpose of Advertising

What I had in mind in suggesting advertising were two things. One, the degree of success that we have had with certain types of advertising, and the other, are we securing the support from the fathers of our industry that we should properly have through the medium of advertising? In other words, a sale is divided into a number of steps, or phases, certain of which could be more economically obtained through advertising and promotional methods; whereas, if the salesman must go to an individual, introduce a brand new product, with which he is unacquainted and with which he may imagine he has no use at all and sell that fellow the thought, the inspiration, and the desire before it is possible to take the order, he is spending good time, multiplying the cost per call and making salesmanship more difficult and more expensive, and, therefore of less importance and worthy of less thought on the part of the fathers of our industry.

There is a possibility of each individual industry so advertising its product as to create the demand and the desire, so that we may go and secure the order with comparative ease, making, perhaps, two, three or four calls on a new consumer instead of ten or fifteen.

That is the thought that comes to me in connection with advertising and promotion. This is not a one-man meeting. At first we thought that we would try to secure some expert salesmen to come up here and give us their views, but after talking the matter over we decided that we had enough talent and experience in our own organization, if we swapped stories, and we could accomplish more than we could by going on the outside.

Now, this is an open meeting. We want to exchange experiences. We want to offer suggestions and criticisms. We want to feel perfectly free in expressing ourselves. We have a stenographer here who is taking our statements down and they are going to be published.

The day of "tricky" salesmanship is gone. The day of truthful salesmanship is here, and I do not believe that a true salesman has any statement in his mind

that he would fear making. We must and we do sell our goods strictly on merit and on truth.

Let us make the report of this committee one which is well read and well considered by our program committee for next year, and please bear in mind that next year we shall have at least one-day's time.

Now, we are open for experiences or confessions:

MR. DOOLITTLE: Do you consider local advertising worth while in an effort to assist you in meeting the competition of a little local hillside producer?

CHAIRMAN BRANDON: There is a very broad question. Personally, I would hesitate to attempt an answer, because in our business we do not deal with that sufficiently to justify an answer. Will some of you folks answer that question? I know we have lots of that in our own state. There is a serious question.

MR. WORTMAN: I do not think so, because it would only be a short time before it would be realized that such advertising was costing a tremendous amount of money.

MR. ALLEN: Speaking for the General Crushed Stone Co., we do not consider advertising of any particular value.

MR. WORTMAN: I presume the question is, what source are we to look for this money to buy our stone. It is largely by public appropriation, whether it is municipal work, county work, or state highway work. Of course, the railroads put a certain amount of money in their budgets for ballast. No amount of advertising in a local way would have much influence on the governing bodies that make that appropriation. Then there is the demand. The advertising does not create that amount of business.

Take for instance, if you advertised for paving streets in St. Louis and that advertising cost you $1,000,000, probably they would not pave many more streets.

MR. BAMBERGER: The townships in our community are building more good roads every day and the tendency is to erect more crushing plants.

MR. DOOLITTLE: Our local townships buy and install their own outfits.

CHAIRMAN BRANDON: You say that your local townships buy and install their own outfits. You then have competition between the salesman of crushed stone and the salesman of the machinery manufacturer. Now, the machinery manufacturer advertises largely and strongly. The crushed-stone producer does not. There is a possibility of crediting this growth of local production to super-salesmanship on the part of the machinery manufacturer, leading the local men to believe that they can do it more economically, or it may be that the advertising creates that same thought.

In our industry, we spend a considerable amount of money in advertising, varying from $25,000 up to $40,000 a year, but we have never, as yet, found it advisable or profitable to advertise blast-furnace flux, road stone, or ballast. Our advertising is limited entirely to our special products. We do find, in our experience, that advertising is profitable. That is, I mean certain kinds of advertising.

The big thought that comes to my mind in this advertising problem is, are we salesmen receiving the executive support that we deserve? I do not think we are. I think that the machinery salesman whom you were talking about, who went out and sold those fellows that little crusher outfit, had much better headquarters' support than we have. Are we in a position to go to our superiors and report this condition to them and ask for relief; and, if so, what sort of an outline should we offer? We find a great many products advertised that would seem almost ridiculous on the face of them.

I remember an advertisement that I saw in a *Saturday Evening Post*. It had a picture of a street car, telephone, an automobile tire, glass tumbler, coffee cup, and there were one-half dozen other articles there. On the bottom of the advertisement appeared, "Do you realize that lead was used in the manufacture of all these articles?" signed, National Association of Lead Producers.

SHALL the National Crushed Stone Association engage in co-operative advertising—what form should it take? Does company advertising pay with just ordinary crushed stone?

Now, should we recommend co-operative advertising to our National Association, or to a local association, or to other associations that we might form, unit associations, we might call them? We have competition in brick, concrete, and a good many patented types of pavement. Those fellows are supported strongly by advertising.

I would like to open this meeting to a general discussion, and let us make this "snappy." Let's open up and give our views on this thing.

MR. McGUIRE: I do not believe that advertising is going to do away with what this gentleman here says. I have known of a case up in Madison where a highway commissoiner spent $20,000 or $30,000 for a whole lot of equipment. After a two-year period he abandoned it because his turn-over was so small; and, in my opinion, if figures could be obtained on costs at these local plants and comparison made of them with our own costs, there would be much advantage in the comparison to us.

MR. WORTMAN: If that is a matter of public record and each one of us who is bothered with local competition ran an ad like that in our local paper once a month, wouldn't that go a long way? It wouldn't cost us much.

MR. HOOKER: I think it is more or less a matter of education and getting these people to know what their costs are.

MR. BONNELL: In my opinion Mr. Wortman's idea would be more effective if we put these experiences in a local paper, or combined them in some sort of a pamphlet, and then presented those facts to municipal, county or state officials, as the case might be, thereby personally calling the attention of the possible customer to the conditions that have attended other people's efforts in that direction. Wouldn't it attract more attention from the real people whom you would want to have?

CHAIRMAN BRANDON: This is a question about which I have grave doubts. I doubt the advisability of any open ad campaign against these local operations, but do believe we should be armed with authentic information, so that we may combat each proposed installation as an individual case. Public general antagonistic advertising might have the effect of introducing the desire to try out local productions where it had not been considered before.

In my judgment, newspaper or magazine advertising on this subject would be dangerous and direct-by-mail questionable.

There is a question, gentlemen, for discussion—newspaper advertising versus direct-by-mail. I am not going to get started on that for a minute. I have some very definite ideas in my own mind. Is there anyone here who has had absolute experience in newspaper advertising along those lines that we are discussing?

MR. ALLEN: I was rather surprised to hear Mr. Brandon say that his company spent $25,000 to $35,000 a year on advertising. That prompts me to ask the question whether all that is legitimate advertising; I mean is not a lot of it prompted through solicitation from political or semi-political organizations, police or firemen's pension funds or some such like source. In other words, do you look upon it as being self-supporting advertising?

CHAIRMAN BRANDON: That all represents money spent in magazine advertising and direct-by-mail advertising.

MR. ALLEN: Requests from numerous sources, many of which merely amounted to contributions, prompted our company's officials to turn down all requests in the nature of advertising some time ago.

CHAIRMAN BRANDON: Our market, for some of the materials such as agstone, and quite a variety of dust (many of these from specially selected stone) is quite wide, necessitating a good bit of that material being sold by advertising and direct-by-mail methods.

I should estimate that probably 20% of our gross advertising expense reflects on local deliveries, such as would be ordinarily competitive with the average stone quarry.

MR. DOOLITTLE: Does it reflect on your general business?

CHAIRMAN BRANDON: Well, the fact of the matter is we do not have any.

MR. ALLEN: Who passed on that advertising, the salesmen or someone else?

CHAIRMAN BRANDON: Up until a few months ago, our president, Mr. Hall, was chief instigator of all of those activities. Since Mr. Hall's death, we have tried to imagine his spirit was with us to dictate to us. Our organization is not complete at this time.

MR. ALLEN: I think that if advertising were left to the salesman to pass on owing to his contact with various agencies who would seek advertising he would find it difficult to determine where to draw the line and a concern operating over a large territory with several sales offices would find this promiscuous advertising pretty expensive.

MR. BAMBERGER: Mr. Brandon's position is different from a good many of the producers. His company is really producing specialties. That is their main line, which they sell over wide territories. Do you think it would pay an individual producer, in a territory similar to our own territory, having a radius of 20 miles, where there are probably 15 or 20 stone quarries all producing, practically, material for two purposes, macadam road stone and stone for concrete, to advertise? For one of those producers to spend a lot of money on advertising, would it pay if the results to him direct would be only one-twentieth of the amount that he spent? The other 19 producers would get as much benefit from that advertising as he did.

CHAIRMAN BRANDON: Does the possibility exist for you, as a producer in competition with 19 other producers, to develop an individuality in your stone?

MR. BAMBERGER: Yes.

CHAIRMAN BRANDON: If it does, then advertising would possibly justify itself in your instance to sell your stone on that individuality, which the other fellow cannot compete with.

There is another phase. I have heard some men argue that the crushed-stone business is a general business, and that the market is wide enough to absorb all of our tonnage, that we should standardize and avoid individuality in competitive fields, such as concrete and macadam and so on. That is a question on which I am open for conviction one way or the other, particularly since we have gone heavily on the thought of trying to give our stone individuality which we could dwell on in our advertising and sales promotional work. We felt we were not selling crushed stone, but selling products which we represent by trade names, and that our advertising would directly benefit us, or at least a very large percentage would reflect to us; that we would make an effort to create for our material, or rather elevate our material to, a standard to which the other fellow would have to work, such as cleanliness, purity and some of those things developed into what I term "personality."

MR. BAMBERGER: Advertising individually is bound to create a certain amount of "personality," because of the simple fact of your own particular name being brought before the public, but just what that would amount to is difficult to say. However, my idea is that in certain competitive localities if all the producers would run some form of advertising to create more general use of their product, there may be some producers who advertise products inferior to yours. Then what?

CHAIRMAN BRANDON: I think it brings it right down to personal contact. I tell you, I admit that personal contact is what you need in the materials ordinarily produced in the crushed-stone industry. In our territory we are in competition with slag, gravel, soft limestone; well, I guess everything that can be made. I think it is salesmanship rather than promotion in your case.

MR. BAMBERGER: I think so.

HOW can a producer of crushed stone give his product personality—individuality—prestige? Does he need to? Should all his efforts at publicity be directed to establish stone as against competing commodities?

MR. ALLEN: Possibly results could be obtained more economically by putting the salesmen on a commission basis, particularly where there is produced specialty products, than by adveritsing.

MR. SCHAEFER: I think you fellows are going off on the wrong track, altogether.

Now, if I were to go out and buy stone in New York State, I would probably buy it from the man who could offer me the quality of stone that passes the specifications of the State Highway Department, and who had the best freight rates to my destination.

As I see this advertising proposition, take one of our plants, we cover a radius of possibly one dozen counties in New York and eight in Pennsylvania, how are we going to advertise so as to reach every one of these towns and cities and villages? And if we do attempt to do that, isn't it going to amount to thousands of dollars? We cannot do that. They did attempt it a number of years ago, but they cannot do it. The cost would be so prohibitive that they just might as well quit producing stone, altogether.

Another thing, you can advertise until "Doom's Day" in a village paper and tell them that the General Crushed Stone Co. product is a wonderful product, but do you think for one minute that if there is a competitive quarry with a lower freight rate that they are going to buy your product as a matter of friendship? If they do, they are going to get kicked out of office.

As far as individuality in advertising is concerned, I cannot see that it can be done as far as the cost is concerned. It may be with you, Mr. Brandon, because you have a lot of specialties—I am talking simply on the matter of crushed stone, not dust specialties, or your grits, but simply crushed stone.

We are producing stone at a price that is practically down to a figure as low as it possibly can be, and to attempt to do any extensive advertising would make the cost higher than what we really could afford to sell the stone for.

My way of looking at it is this: We are all engaged in the crushed-stone business. I will just mention my own particular state, New York. We do not care what stone they take, but we do want them to take stone in preference to gravel, slag, or something else. Don't we? That is our object. I think that collective advertising is better than advertising by individuals.

I think there should be pamphlets showing what crushed stone means, and why it would be more preferable for a company to buy high-grade stone, rather than roadside stone. Here, our material is put through a crusher, graded, absolutely uniform in size and quality and goes out into the road-bed as such, and you have the same degree of efficiency, and quality, all the way through your road. But with the roadside pit which sells a little cheaper than you do, it will not be long before you find that the soft stone gives way and the ultimate result is that within the next year you are going to find a lot of holes along the road. Isn't it better then for a man to pay ten cents more for a ton and know that he is getting a uniform quality of stone? That is the way I take it.

My experience as a former superintendent of highways is that we were able to procure stone a whole lot cheaper when we took the freight rate into consideration, but we did not get the quality, and as a result we did not get the road, and as time went on we paid more for the maintenance and upkeep of that road than the extra cost of good stone at the time of construction.

Do it for the stone industry, as a whole, and not for any individual company.

The other side of the question is this: I am speaking for New York: A county or a town or subdivision of the state raises by taxation a certain amount of money each year, and the Board of Supervisors or the Township Board, or whoever the governing body may be, lays out a program for that year, and they say you must build so many miles of road on this appropriation. The people in charge of the construction naturally say, "What can I

use in that construction with that amount of money available? And several times it has happened where they really intended to use crushed stone, that the amount of their available resources was so small that they had to put in gravel or some cheaper type. I combat that by saying, "Wouldn't you prefer to have one mile of imported stone, good quality, rather than more miles in length of some inferior construction?" And they are coming to that way of thinking. That is just another thought along the same line.

It is my personal opinion that our advertising ought to be collective, as a unit. That is the crushed stone industry against something else, against competition, but not my stone against your stone, and not to cite particularly the case that my stone passes specifications by 20%, while your stone passes only 1%. You are a crushed-stone producer, and I say, "Let's back him and stand by him in preference to the other fellow."

CHAIRMAN BRANDON: Gentlemen, I think Mr. Schaefer expressed the right thought when he said our advertising should be co-operative or collective.

I am just wondering if we are at this time sufficiently in accord on that question that some individual might offer a resolution in order that it could be presented in our report, stating our views on advertising. It might be stated in a short, concise way, that would qualify us as an institution within an institution. We are a group of salesmen within the industry of crushed stone, and if we passed a resolution, it would probably carry some weight, probably bring about a recognition of the salesman quicker and more strongly. I am wondering if it is the consensus of opinion that we are close enough in accord to have a resolution offered.

MR. BAMBERGER: I think one of the things that we ought to find out before we present this resolution is the approximate cost of that advertising.

MR SCHAEFER: Didn't you mean advertising by the National Association?

CHAIRMAN BRANDON: Personally, I hesitate to say at this time, whether or not the National Association could cover the field sufficiently thoroughly to reach each local condition that may be affecting the various states.

Advertising that costs more than the results is worthless. If advertising will not be productive of sufficient amount of increased sales to overlap the cost of advertising you had better leave it out. If we cannot increase our sales sufficiently to overcome the cost of advertising, we had better let it alone.

I believe if this resolution is passed it should be in a general way, not in an effort to lay out a definite program, but more with the idea of suggesting a thought to the masters of this industry that may develop into action if we follow it up closely for a year or so. I do not think that we are in a position, today, to lay out a definite program.

MR. ALLEN: It is pretty firmly established in my mind that highway engineers and other authorities having jurisdiction over such matters will not be influenced by any advertising promotion or propaganda as to the merit of stone compared with slag or gravel. If slag or gravel is a satisfactory aggregate for use in road construction it will be used where readily accessible on account of the lower cost, and in the last analysis it is quite natural to suppose that whatever aggregate has proven satisfactory and is the cheapest will be used—time alone will ultimately determine this. If there are specialty products like Mr. Brandon has it may be worth while to advertise but to go into an advertising campaign to promote the use of crushed stone in preference to gravel or slag or some other material will avail us nothing.

CHAIRMAN BRANDON: Shall we table the discussion, and proceed with the rest of the program? I believe we have a conception of a permanent section in this National Crushed Stone Association. I believe that in future meetings we are going to have these luncheons again. It may be just as advisable to take this matter under consideration and consider it at the meetings from now on.

HOW about descriptive pamphlets issued by the National Association for the general education of the public on the quarry industry? Is it feasible?

MR. ALLEN: I offer a motion that the question of advertising be tabled for the time being.

MR. SCHAEFER: Rather than go on record as tabling this question of advertising, I think it would be better for us to have some sort of a resolution presented to the convention at large, in which we ask that the owners and managers, of the larger units at least, give more consideration to such local advertising or propaganda, as a salesman thinks wise. In other words, bring ourselves a little bit more to their notice, even if you do not make a definite proposal.

CHAIRMAN BRANDON: There is a motion before the house. Mr. Allen has presented a motion which has not been seconded.

MR. ALLEN: I am willing to withdraw my motion, or there may be modifications to my motion.

MR. BONNELL: I think a motion should be made, incorporating a few ideas, to the effect that we do not want to recommend any definite plan of advertising at the present time, but that consideration should be given to the salesmen's recommendation. I suggest that it be brought to the attention of the owners and the directors of the National Crushed Stone Association.

MR. WORTMAN: I think a committee should be appointed to consider the advisability of advertising that would be appropriate for the National Crushed Stone Association.

MR. SPORBORG: I came into the room when Mr. Brandon was saying that advertising which is not self-supporting is worthless.

If this is a suggestion that the National Crushed Stone Association should take any kind of activity in the way of advertising, I do not believe that it is a reasonable thing to do.

The matter of advertising is a problem that each concern must solve for itself, according to its conditions. I know one concern in the stone business that does spend money and effort in what might be termed in a general way advertising. I am thinking that our own company will do something along that same line, if we can see our way clear how to do it, providing we are able to make it self-supporting.

CHAIRMAN BRANDON: The consensus of opinion on this advertising proposition is that we should simply make a little noise here. We have no definite program to suggest. We simply want to shoot the skyrocket into the air and let you fellows know there is a salesmen's gang at this convention; and we are going to tell you fellows that we salesmen think that we deserve more support on your part in our sales efforts—the idea being to force a recognition of ourselves on the fathers of the industry; that the salesman is one paramount issue of this business, which has not been recognized to date. We have not recognized a definite program or an absolute agreement on what should be done. We think that if we get you fellows working and thinking on these matters you will realize their value and become interested.

MR. SPORBORG: Let us assume that I am the executive and you are the salesman. Of course I like evidence of independent thought on your part and am predisposed in favor of your proposal. All right, you figure out definitely what you want to do, and what you think will be accomplished, and do not forget to tell me how much it is going to cost, bring it in and we will look it over.

MR. BONNELL: I think so far we have all proven the truth of what you have said about the local conditions. Practically every man who has spoken this noon has brought that very thing into the limelight, that each operation must have its own problems of advertising in reaching the trade, and that has practically side-tracked any talk leading to a general program.

MR. SPORBORG: I think that is a thing out of the question.

MR. WORTMAN: Crushed stone was the first product used, and the slag people have come in and sold through advertising and promotion.

MR. SPORBORG: They did not do it along promotional lines.

MR. WORTMAN: I am getting advertisements every week from the slag people. The slag people have advertised individually.

MR. SCHAEFER: What I meant to bring out was the thought of letting people know that there is such a thing as crushed stone. I do not mean to say that we should advertise your stone alone, but let the people know that crushed stone is on deck, and if the National Crushed Stone Association is good enough to spend one-half of 1% on some kind of propaganda that will spread the word around the United States that crushed stone is here and here to stay, more than they think it is, it is going to make it much easier for us fellows who go out to get the business.

I think that the National Crushed Stone Association can cheerfully afford to spend a certain amount of money in putting out pamphlets, or something in a similar manner to the slag association, and let people know that there is such a thing on this earth as crushed stone. That is the main thing, then if anybody wants to supplement that by individual advertising, that is up to him. I say, benefit the industry as a whole.

Mr. Chairman, in order to bring this matter to a close, I make a motion that it is the sense of this committee (if I may term it a committee) that the proper authorities be instructed to give more recognition to the selling end of the business during the forthcoming convention; that we, as salesmen and sales managers and other men, who dispose of our material, are interested in having papers and other discussion relative to the sales end of the game; that we feel we are as much a part of the crushed stone industry as the president, superintendent or treasurer; that the superintendent produces the stone, we get rid of the stone, and the treasurer collects the money, and we do not want one-half hour out of three days any more.

We have voiced our sentiments and we hope that it goes to the "big guns" at the front that they will give us one-half day, and we will prepare our program and give them something that will surprise them within the next few years.

. . . The foregoing remarks were seconded, put and duly carried. . . .

MR. SPORBORG: I am going to say that if those of us who attend conventions will bring forward ideas, expressions that are interesting to us, they will be welcome. They will have all the time, I am sure, on the floor of the convention that the interest and value of their subject matter warrants.

CHAIRMAN BRANDON: If there is nothing further to come before the meeting, we will adjourn.

Organization of Salesmen Formed

The second sales luncheon was not reported, but according to Chairman Brandon, was even more interesting than the foregoing. A number of ideas were developed and a permanent organization of crushed stone salesmen was formed with the following officers:

Harry H. Brandon (Ohio Marble Co., Piqua, Ohio) chairman; George E. Schaefer (General Crushed Stone Co., Rochester, N. Y.) eastern vice-chairman; J. H. Heintz (Columbia Quarry Co., St. Louis, Mo.) western vice-chairman; F. S. Lack (Lack Limestone Co., Paducah, Ky.) southern vice-chairman.

This committee was appointed to organize the salesmen of the industry and prepare a program to represent sales at the next convention.

It was decided at this meeting to request the Board of Directors of the National Association to set aside at least a whole day of the next annual convention for discussion of sales work and sales problems, and that this new sales organization have charge of this day's sessions.

This resolution was subsequently presented to the new board of directors and agreed to, so at the next annual convention the salesmen will have something to say.

Part of the program of the new committee for the ensuing year includes:

1. Solicitation of all quarries to take out membership in N. C. S. A. for as many of their salesmen as possible.
2. Have as many of their salesmen at the convention as is possible.
3. To create a greater interest in sales problems and their solutions.
4. Encourage greater educational support to salesmen. Develop new and better methods in sales. Develop a better actual knowledge of crushed stone and its value among salesmen and executives.

Resolutions Committee Report

MR. RICE: I will report for the resolutions committee.

CHAIRMAN SCHMIDT: You have heard the resolution in reference to railroads. There is not a question but that the railroads gave us good service last year, and as President Baldwin stated last night, 1923 was the first normal year they had had a chance to work under the existing laws. The resolution appears to be a good one, and I hope it will have the support of this meeting.

MR. GRAVES: I think it would be a matter of courtesy for the secretary to notify Mr. Baldwin that the resolution was adopted and that it will be transmitted to the House of Representatives.

After a brief illness, A. Acton Hall of Piqua, Ohio, president of the Ohio Marble Co., passed away at his home on December 26. For many years he was an active and influential figure in the stone industry, and was at the time of his death a director of the National Crushed Stone Association and had been a member since its foundation.

Therefore be it resolved by the National Crushed Stone Association in convention assembled at St. Louis, January 23, 1924, that it desires to bear witness to the sterling character, rugged honesty, high purposes, and genial fellowship of its friend and associate.

That it recognizes the great loss to the industry and to his friends occasioned by his death.

That the loving sympathy of every member of the association be extended to his family and his associates, to the Ohio Marble Co. That copies of this resolution be engrossed and forwarded to his family and his company.

The National Crushed Stone Association in convention assembled in St. Louis, Mo., January 21 to 23 by resolution heartily indorses a reduction in federal taxation in principle and to the extent recommended by the Secretary of the Treasury, and that a copy of this resolution be transmitted to the President of the United States, to the president protem of the senate, and to the speaker of the House of Representatives.

The National Crushed Stone Association in convention assembled in St. Louis, Mo., January 21 to 23, by resolution opposes the principle of a bonus to the able-bodied, ex-service men, but heartily indorses every assistance to those men who were disabled during the war, and that a copy of this resolution be transmitted to the President of the United States, to the president pro tem of and Senate and to the speaker of the House of Representatives.

Be It Resolved, That a committee of five active members be appointed to consider the question of standardization of various equipment details, which committee shall have the power to add to its number or appoint a sub-committee to confer with manufacturers to the end of accomplishing this purpose.

On the Railways

Whereas, The prosperity of our country depends on adequate and efficient transportation service; and

Whereas, Because of conditions encountered, transportation for a period, beginning during the World War, became inadequate and inefficient; and

Whereas, Statistics now amply evidence that the carriers have recovered from their disabilities, having in the past year handled the largest tonnage in their history with the least car shortage; and

Whereas, The transportation act of 1920 is an instrument designed to advance transportation and it is usually conceded that its effect has been generally satisfactory; and

Whereas, There is every reason to believe that some of the provisions of the act should be repealed or amended, nevertheless, the practical operation of the act has not been of sufficient period to warrant action at this time. Legislation by the present Congress might invite radical actions and thus destroy the provisions of the act which are generally admitted to be constructive; therefore be it

Resolved, That the National Crushed Stone Association respectfully petition the Congress of the United States to defer any action looking to change or modification of the transportation act of 1920 for the period of at least two years.

Roundtable Discussion of Quarry Operation

MR. A. R. WILSON: We strip with water. We use a deep well pump, 7x10-in., which pumps the water under 300-lb. pressure up to an elevation of about 250 ft. above the river. The force of the nozzle is such that a man cannot hold it. We have to arrange to have a horse or A-frame there. We have found that to be a very successful method of removing the overburden. We have to have three men to handle the overburden. One thing that we have to do below is to impound the debris. We have to keep a dam about 2 ft. above the water. We have two different impounding places. We let one dry out and send the debris to another. As soon as that is dried out we raise the other dam, which will be about 3 ft. high. We have done that since 1905 very successfully. We have not kept track of the cost per cubic yard, but the cost per ton of rock removed is the way we keep it; $1.84 per 100 tons of rock. Some of the stripping is very hard soil. That material rolls down the hill at times so thick that chunks 8 or 10 in. in diameter are rolling along, and when they reach the bottom of the hill they are practically round, like a baseball.

Quarry Stripping

CHAIRMAN SCHMIDT: Gentlemen, there are certainly various ways of stripping. We would like to hear from anyone who uses a hydraulic or other method.

MR. THOS. SULLIVAN: We have a stripping operation that puts Mr. Wilson's in the shade. I believe it is the largest in the world in one respect—that is, the quantity of overburden removed to the tons of stone recovered. We have removed waste material 110 ft. high for 24 ft. of stone. Our stone ledge is practically level and should be 24 ft. thick, but glaciers or prehistoric rivers eroded some of it to such an extent that there was only from 2 to 12 ft. left. There was no "dip" in the overburden to correspond with the dent in the stone ledge. In fact, we removed 80 ft. of overburden in some places for 12 ft. of stone. If anybody doubts my word, I have a few pictures of the actual operation to show.

CHAIRMAN SCHMIDT: What do you do with the dirt?

MR. SULLIVAN: From 5 to 80 ft. was washed into the river. Part of this has been brought down to St. Louis by the Platte and Missouri rivers, made the water rich and creamy to fatten the St. Louisans. From 20 to 30 ft. of material, too hard to be removed economically by the hydraulic method, was loaded with a steam shovel, hauled a half mile and dumped on low ground. We used an Allis-Chalmers centrifugal pump, 8-in. suction pipe, 6-in. discharge pipe, 4-in. hose, 2-in. nozzle.

CHAIRMAN SCHMIDT: Will someone start the discussion on drilling? There are certainly many ways of drilling.

MR. MAGRATH: Have you any idea of the relative cost of using a small compressor, of a portable nature, as against a central compressor with a long air line? There is quite a difference of opinion, and I wondered just how the costs compared.

A MEMBER: The pressure gauge showing 100 lb. at plant registered 95 lb. at 1200 ft. distance in ordinary temperature. During the winter time we have to carry a little fire.

CHAIRMAN SCHMIDT: There are various methods of drilling.

MR. THOENEN: In connection with conveying air, I have not had much experience with quarries, but in mining I have carried air through a 5-in. line for a mile and one-half, with only a 5-lb. drop with initial pressure at 100-lb. gage.

CHAIRMAN SCHMIDT: Is Mr. Dodson's representative in the room?

MR. BRIGGLE: This stripping proposition, with us, does not amount to anything, you might say. We strip ours with a horse and plow and scratch around a little bit. We have a mill to screen out the majority. So far as the deposit is concerned, it is a boulder formation, and the only thing we do is scratch around and take out what we can. Of course, if we had 185 ft. of dirt to handle, we would hunt for a quarry, but so far as our stripping is concerned it does not amount to anything to us.

Mining vs. Open-Pit Quarrying

CHAIRMAN SCHMIDT: That brings us back to drilling. Everybody seems to be satisfied with their drilling, so nobody has anything to say about that.

The next subject on the list is mining vs. open-pit quarrying. Is Mr. Thoenen in the room?

MR. THOENEN: I do not know just what to say on this subject. I have done some mining of limestone. However, I would rather answer questions. If any of the members would like to ask questions as to mining vs. quarrying, I would be glad to answer them to the best of my ability.

CHAIRMAN SCHMIDT: This gentleman is a mining engineer and is prepared to answer questions on that subject.

MR. J. J. SLOAN: In your mining, using the method of retaining pillars to support the roof, what size rooms do you have?

MR. THOENEN: That will depend entirely on the nature of the rock. In some formations we have mined as wide as 240 ft., from foot to hanging, as we call it. In other places 40 ft. is a maximum safe width; it depends entirely on the nature of the rock, and that must be judged mostly from experience. There is no set rule.

I might say that the main advantage that appeals to me in connection with mining vs. quarrying is that you get away from weather conditions. You are not troubled by rain or snow. Your temperature under ground is the same day in and day out. You also have a sort of a balance wheel in progress of operations in that you have a storage capacity underground due to the manner in which you must break your rock. You break down and work on top of the rock, using a combination of shrinkage stoping with room and pillar mining.

MR. MAGRATH: What is the relative amount of powder?

MR. THOENEN: That also depends on the nature of the rock. Powder costs vary, of course, in an individual quarry or mine, but I do not think there should be much difference in open-pit and underground operations, if both are efficiently handled.

MR. BRIGGLE: How high a face can you handle?

MR. THOENEN: You can go as high as you want to. We do not carry a face in the sense that you carry a face in the quarry. We carry a breast 12 ft. high or 6 ft. high, depending on the nature of the ground, and then raise and work back toward the open quarry, in one case. However, that depends on how much money you want to put in underground; i.e., capital tied up in underground storage. You can take out about one-third of the rock that you are breaking while operating. Your ground will expand in that proportion.

MR. BRIGGLE: In regard to loading, how do you manage that?

MR. THOENEN: You mean in loading out? You can use rooms large enough for a steam shovel. Does that answer your question? We have open rooms 40 ft. wide and 50 or 60 ft. high.

MR. BRIGGLE: What is your tonnage?

MR. THOENEN: This particular quarry that I had in mind was hand-loading and it ran about 200 to 500 tons per day.

MR. BRIGGLE: That would be a very small operation. Instead of taking the bottom out first, then shooting the roof up from below, we take the heading out first and then we raise from the bottom. My

opinion of your method of quarrying is that you are going to find your running costs much larger and also your powder costs larger than if you took the top out first and then raised from the bottom. It will take you as long to drill one of these holes as it will on the surface.

MR. THOENEN: No, we drilled as high as twelve 20-ft. holes with one machine in one shift.

MR. BRIGGLE: But you are breaking lime, and you cannot break very much lime in that way, especially when your breaking is very small.

We start out those pillars by taking the heading out, shoot up the slope about 25 ft., then come along with the drill and raise that whole thing up.

MR. THOENEN: Well, we go up into the back and break it down.

MR. BRIGGLE: Your method we call back stoping, or taking down the roof. If you get a real proposition where they have to get a lot of rock, you will be sending back home for more money in a little while. (Laughter.)

I have mined two acres on pillars about 25 ft. wide and 70 ft. apart ,and in this way you will never have any trouble.

MR. THOENEN: You cannot do that in all kinds of limestone. Your limestone has to be solid.

MR. BRIGGLE: That is the kind that we have. With our procedure, you can operate during wet or cold weather and have clean stone.

MR. THOENEN: Of course, mining cannot be applied to all quarries. There is no question about that, but there are certain conditions where quarries can be operated by underground methods more efficiently than open-pit methods.

In connection with your question as to back stoping versus underhand stoping, as we call it, I was ten years in Canada with one of the big nickel corporations where we produced at the rate of 20,000 tons of nickel ore a month from 1000 ft. underground, and we found that by balancing both underhand as against back stoping methods that the back stoping method was cheaper by 50%. That is, where you have back stoping or underhand stoping of at least 100 ft. vertical height. The reason for that was greatly due to accumulation of rock on drilling benches. Your high-priced machine labor is used in clearing off those benches, and I do not know how you can get away from that.

MR. BRIGGLE: We have tried it every way, and we have a very good system, I think. If I were to follow your scheme, we would go broke. We nearly went broke anyway.

CHAIRMAN SCHMIDT: Are there any other questions?

I would just like to ask if we are in a position to give any information regarding the comparative costs of mining limestone as against quarrying in the average open quarry. Just a rough estimate.

MR. THOENEN: I have no figures on that, here.

MR. BRIGGLE: The cost of mining was 68 cents during the war, or just before the war, and after the war it was about $1.15, which would preclude a man mining rock underground, when he is selling his output for $1 per ton. In other words, you could not use an underground quarry system that would cost you $1.15 per ton when your average selling price was $1. You would be out of business before long.

MR. STEWART: I think, maybe, if the gentleman would tell us about how many men he had on the pay-roll in that one particular quarry that he was getting out 200 tons a day, it would give us a comparison.

MR. THOENEN: We figured that we broke 63 tons per machine man. This covered both preliminary breast stopes and back stoping taken altogether. We handled 16 tons per mucker. Does that answer your question?

MR. STEWART: How many men did you have in your employ?

MR. THOENEN: I have not any figures on that here.

CHAIRMAN SCHMIDT: Are there any further questions on this subject? If not, we will discuss the effect of blasting on nearby buildings. That is an interesting subject. Mr. Rice, have you anything to say on that subject?

Effect of Blasting on Nearby Buildings

MR. RICE: I suppose we have gone more exhaustively into the defense of our case at Winchester, Mass., than has ever been attempted before. The complaint was for damages and an injunction. We could probably have settled the case for a few thousand dollars, but there were many other houses in the neighborhood which were subjected to the same vibration and we felt that in the interest of our own defense, as well as to ascertain the truth, we could make the most exhaustive kind of examination for the purpose of ascertaining the facts.

The defense cost us about $35,000, and we approached it from every possible angle,—that is, we had as experts building contractors, practical blasters, practical quarrymen, well-drill experts, chemical engineers, physicists, seismologists and civil engineers. The case ran over a period of something more than two years and has not yet been decided, although we expect a decision by April 1. Our investigations proved to be wonderfully interesting.

Are there any questions that any one would like to ask?

MR. STEWART: What did you actually find under all these tests?

MR. RICE: We found substantially that the cracks in the house in question and in the houses of the 60 or 70 other witnesses who testified as to the condition of their houses that the cracks were in all cases due to a settlement of foundation or the shrinkage of the timber within the building. The proof of this was that the cracks in the plaster were all consistent with the distortions which would be produced by these causes, without having cracks in other directions which might be produced by other causes.

It was scientifically proven that vibration causes a reversal of strain and that therefore the consequent cracks would be in opposite directions—that is, at right angles to each other and crisscross, because the plaster would first be strained in one direction and then in another if caused by vibration. Incidentally, it was of interest that in some of the pictures in the New York Times showing the results of the Japanese earthquake it was very evident that in the plaster buildings in Tokio most of the cracks were distinct Xs, confirming the theory that was set up in this connection.

Prof. Reid, of Johns-Hopkins University, one of the most eminent seismologists in the world, introduced photographs of this character showing the results of the San Francisco earthquake. He indicated the fact that it was practically possible in almost all cases to determine definitely the cause of cracks in plaster in a building. Of course, there are shrinkage cracks which occur in ceilings and walls which are different from cracks due to the distortion of the rectangle of a wall, such cracks generally paralleling the studding or the lath.

Remarks on Screening Problems

MR. MAGRATH: I did not come to this meeting expecting to be called upon for any remarks on this subject, as I have been unable this winter to find time to get my data in shape. However, I am very glad to give you my ideas on this subject very briefly:

Our company has had a great deal of difficulty in separating and screening our smaller sizes of limestone, and we have spent considerable money in working out this problem. By smaller sizes I mean all that which passes a half-inch ring.

We have been trying to separate this material (through one-half inch) into ¼ in. x ½ in. and minus ¼ in. We are also anxious to make a product minus ¼ in., which contains less than 1% through 100 mesh. We have tried to retain as much of this minus 100-mesh material in a separate bin as possible as it is very valuable for agricultural purposes. Moisture and clay, when present even in minute quantities, make this a very difficult matter.

We have tried four of five makes and kinds of screens, revolving reciprocating or

shaking, mechanically vibrated, and electrically vibrated, and have practically decided that the only solution to the problem is to use water. We do not use the water with the idea of washing or cleaning our product, but to assist in the screening and sizing of the same. In doing this we have found that the water removes most of the clay except from the 100-mesh material, which we are not very particular about, as it is the material, which settles out of the run off water and contains material as large as 20-mesh.

We tried several schemes for using the standard revolving screen for screening smaller sizes with water, but were unable to find any device which would keep the perforations or holes in the screen cloth free of chips without wearing out the cloth or screen plate much too rapidly.

We tried arranging a roller in such a way that it would roll on the outside of the screen plate or cloth and thus drive out the particles of stone stuck in the screen. We also tried a series of foundry scratch brushes rubbing against the outside of the screen cloth or plate. Wire cloth was tried, also perforated plate with square holes, with round holes and with oblong slots. None of these schemes kept the screen from clogging up, so we discarded the idea of using the revolving screens for this purpose, and have gotten very satisfactory results from the vibrating screen.

I therefore believe that the most successful way of using water for separating small sizes of limestone is in connection with a vibrating screen. We have tried it with electrically vibrated screens, the "Hummer," and also mechanically vibrated, the "Universal," and find the latter type very satisfactory. The trouble with the electrical machine is that water gets into the solenoid and burns out the coils, whereas the repairs and upkeep for the "Universal," apart from screen cloth, are very small.

As to the cost of separating finer sizes with water, I may say that this is very small. We are using a 5-in. pump and are separating about 80 tons of stone per hour and have more water than we need.

There is only one angle to be watched in this connection—water must not be allowed to drip into the bins which contain the screened stone. Anybody who has run a gravel washing plant knows what will happen. The clean stone in the bin acts as a filter bed and the water which contains the limestone dust in suspension is filtered in the bin, with the result that in an hour the bin of what was clean stone is a mixture of stone and screenings.

CHAIRMAN SCHMIDT: Are there any questions that you would like to ask on that subject? Mr. Magrath has had considerable experience along that line. If not, is there any one in the room who has had experience with new types of grizzlies? Every one of these subjects have been questions asked to be brought up for discussion. Certainly some one is interested. I skipped a couple, transportation systems—the best, hoist information, and crushing and pulverizing experience. If nobody has anything they desire to say, we will skip the rest.

New Concaves for Old Crushers

MR. MAGRATH: I would like to ask a question, and, that is, if any of the members tried changing their concaves and what results they obtained for re-crushing. We tried putting in a vertical concave, and it seemed to increase the capacity for crushing. I just wonder if that is general.

CHAIRMAN SCHMIDT: It is a new thought with many of the crushed-stone people. They are making some crushers, I believe, with nearly vertical concaves now. We will have to ask some of the crusher people that question sometime this afternoon.

MR. STEWART: We have taken the concave out of our old crusher and had a heavier concave casting put in that crusher. I think we have increased our capacity 50%, without any other changes, other than taking the old concave casting out and putting in this newer type.

MR. BRANDON: Does that cut the size of your receiving opening?

MR. STEWART: Surely, that cuts it down. However, it depends on the size of the product you want, and whatever thickness you make the concave.

New Illinois Rock Crusher Will Drill for Oil for Its Fuel

FRANK M. CONOLLY of Galesburg, Ill., C. J. Tiernan of Macomb, Ill., and J. J. Sullivan of Chicago will shortly begin the erection of a $150,000 stone crushing plant near Macomb. The plant will have an initial capacity of 1000 tons per day.

A lease on 142 acres of a limestone deposit has been obtained and this property has been thoroughly investigated and mapped as a preliminary operation.

What makes this project particularly interesting is that the company will drill oil wells to produce fuel for the plant. This procedure is justified by the fact that the plant is located in the producing oil field near Macomb.

Diesel engines will be installed and connected to electric generators, so that the plant may be electrically driven. In this way the plant will be independent of outside sources for its power.

The plant will furnish a market which now obtains most of its crushed stone from Chicago and vicinity.

Dolese & Shepard Company Show Good Profit

THE Chicago Daily *News* of March 5 says of the Dolese & Shepard Co., who operate one of the largest stone quarries near Chicago:

"The company during 1923 decreased its bills and accounts payable by $108.195 and decreased their deficit $108,654. As of December 31, 1923, current assets were shown at $652,000 and current liabilities $139,600. Operating profit for the year was $203,980."

New Rock Crusher Near Napa, Calif.

Basalt Rock Co., has begun the construction of a $150,000 rock crushing plant near Napa, Cal. The rock to be crushed comes from the "blue" rock ledges near the Napa state hospital. The output is expected to be 2,000 tons in 8 hr.

The rock will be loaded by a Marion steam shovel and hauled by dinky to the Telsmith primary crusher. From the primary crusher it will be sent to the secondary crushers and screening plant at the storage yard by an aerial tramway.

The storage yard will be over a concrete tunnel with a conveyor belt which will load the various sizes on to cars.

A second tramway will take a part of the crushed and screened product to the State Highway electric road and the S. P. Railway. The combined length of the two tramways will be 9,100 ft.

The design of the plans is due to G. W. Kilear, of New York. L. J. Alexander is president of the company and A. B. Dodd is its mining engineer and geologist.

Curious Use of Cement

THE *Engineering and Mining Journal Press* gives a new and curious use of portland cement. In the treatment of copper ores in Tennessee by the flotation process it has been found difficult to float the copper ores and keep other minerals from floating. Six or 8 lb. of portland cement added to the flotation machines for each ton of ore treated has been found to work better than the usual oils and toes for floating the copper minerals under these conditions.

New Indiana Crushed Stone Company

THE New Point (Indiana) Stone Co., of which Myron Freeland, Carl E. Brown of Greensburg, and Theodore Wanstrath of Batesville are the incorporating directors, recently filed articles of association at the office of the county recorder. The articles designate $30,000 as the amount of capital stock to be divided among 300 shares of $100 par value.

The principal place of business is given as New Point and the articles provide for the quarrying and crushing of stone and manufacturing allied with the stone industry.—*Greensburg, Ind., Times.*

Electric Power Contracts

By W. L. Berry
Assistant Sales Manager, Union Electric Light and Power Co., St. Louis, Mo.

IT WAS with pleasure that I accepted the invitation to appear before this body to discuss the subject assigned to me. Such meetings as this present opportunities to those in our industry to acquaint representative groups of our important customers with some of the factors, problems and ideals of our business. Frank, open discussion of these factors leads to mutual understanding and sympathetic co-operation.

To the average citizen our business is somewhat mysterious. We sell a product that is silent, invisible and generally intangible. It is measured in a sealed black box filled with a bewildering complexity of wires, gear wheels and dials. To add to the general mystery of the whole, our terms are unintelligible to the average citizen. We speak of demands, kilowatt-hours, amperes, load factors, diversity factors, power factors, etc.

Therefore, an opportunity to clear away some of the mystery is always welcome. For, while our business is a complex one, having phases not encountered in private industry, yet in its fundamentals, it is just as simple as other businesses.

In my discussion of the subject "Electric Power Contracts," which has been assigned to me, I will try to avoid delving into involved complexities but will confine myself to a discussion in non-technical language of the broad principles affected. Should any of you desire information about any specific points, I shall try to answer questions.

In the first place, I think it well to define an electric power contract as simply an agreement on the one part to use electricity and to pay therefor the legal rates, existing at the time the contract is entered and as changed from time to time by authority of the state commission.

On the part of the electric company, the obligation rests to supply service as nearly continuous and uniform as possible and charge therefor only the legal rate.

Therefore, other than for the consideration of the equity of changing rates during the life of a contract (which I shall be glad to discuss if requested), discussion of this subject settles down a consideration of rates.

Rates are the charges for a service. They correspond to the selling prices of commodities in other lines of business. In all profitable businesses, the selling price is made up of the cost of the commodity delivered into the possession of the buyer plus a profit. So in our business, the rate covers the cost of the delivered service plus a profit. This profit is limited by the public regulatory body to an amount much smaller than private business generally enjoys. It is to your interest that we be permitted to earn a fair profit, as it is recognized than an unprofitable business transaction will be satisfactory to neither seller nor the buyer.

The Basis of Rates

Now, since rates are nothing but costs plus profit, our consideration of the subject narrows down to a consideration of costs. In all businesses, costs may be divided into two broad classifications:

First—Overhead or fixed costs, in general arising from investment, and which do not vary with volume of production.

And second—Operating costs or costs arising from operation which do vary with volume of production.

So also in our business, we have these two general classes of costs which must be covered if the business is to be conducted on a profitable basis.

In our business, the fixed or overhead costs are expressed in your rates as demand charges. Under this heading will come value of money, depreciation of equipment, obsolescence of equipment and the not inconsiderable item of taxes.

FACTORS that influence the cost of electric power—why rates vary with locality and conditions. What load factors, diversity factors, power factors, etc., mean.

In connection with the these items it should be remembered that, due to the special conditions in our industry, they have a greater bearing on cost than is the case in many other classes of business. For example, capital is turned over several times per year in the average business whereas in our industry it is turned over once in three to five years.

Then again, due to rapid development of more efficient equipment for the generation and distribution of electricity, we have not been able to purchase equipment and use it to the point where it is worn out. It has been necessary to replace it while still in good operating condition with the newer and more efficient equipment placed on the market. In my own few years in the business, a transition has taken place from small low pressure boilers and triplex Corliss engines to mechanically-fired high-pressure boilers and then to boilers tremendous in size, operating at great pressures and high degree of super-heat and into which powdered coal is sprayed in a stream resembling fuel oil. To these boilers gigantic turbo-generators are connected. Any one of these latter units is capable of producing three times as much power as the whole original plant. We cannot clearly forsee what improvements the future holds. The introduction of the mercury boiler now under actual operation may show such economies that much of the present equipment must be displaced.

Each of these replacements of equipment has resulted in a lower overall cost of power and it has been the duty of the electric company to find the money to make the investment that would reduce the cost of electricity to its community.

In addition to the overhead or fixed costs, represented by demand charges in our rates, we also have the operating costs which vary in proportion to the volume of production. In our rates, this class of costs is generally covered under the heading "Energy Charges." Such items as coal, water, oils, operating labor, etc., will come under this heading.

Considering only these two classes of costs, it is apparent that the customer who will enjoy the lowest rate is the one who uses his service for the longest number of hours, or expressed in technical terms, the customer with the highest load factor.

A third factor which influences the cost of electricity is the size of the individual customer or, in terms of ordinary business, whether the sale is wholesale or retail. It must be apparent to all that it costs more to service 1000 small customers, each of whom uses 30 kw.-hr. per month than it costs to serve one large customer who uses 30,000 kw.-hr. per month.

In the first case, we have miles of distribution lines to erect, 1000 connections to make, hundreds of transformers to install, 1000 meters to be installed, read and tested, and 1000 bills to be rendered and collected. With the large customer we have one connection, one meter and one bill. Therefore, it is apparent that the size of the customer's load has a direct influence upon the cost of service and must be recognized in the electric company's rates.

How Various Factors Effect the Consumer

The three factors which I have mentioned apply impartially to all electric companies. We now come to a fourth factor which influences the cost of service; that is, the time of customer's usage of energy. The value of this factor of costs varies with local conditions and must be considered in the light of such local conditions.

It is possible that an electric company, serving a community in which little or no

manufacturing is done and in which practically all electricity is used for lighting, will have high system peaks during the lighting hours of the evening and greatly reduced use of equipment during the day. If a daylight load requiring no increase in the electric company's generating equipment could be secured, such a load could be served at a lower cost. The reason for this, of course, is the reduction in the fixed costs brought about by the absence of investment in generating equipment.

Now most of those interested in securing so-called off-peak rates base their plea upon a condition of this kind and draw the conclusion that all demand charges should be waived. Such people are wrong in two vital particulars.

In the first place, even if the electric company's load conditions were as represented, this would not by any means bring relief from all fixed costs in connection with the added load. Certainly it cannot be denied that the electric company must make investment in transformers, distribution lines, substations, meters and other form of equipment to serve the added load. Even in the generating station, wear and tear or depreciation of equipment will ensue from the operation of that equipment. So that, while there will be some reduction in the fixed costs under the conditions set forth, by no means will all such costs be removed.

About "Off-Peak" Rates

However, the supposition made in this case is also wrong as to conditions assumed. I doubt that you will find anywhere conditions so ideal for the support of the plea for off-peak rates. Elecric companies today are no longer lighting companies. They have become electric service companies. Their service includes light, heat and power, and the heat and power end of the business is developing at a pace much greater than the lighting end of the business.

I have given this much time to the so-called off-peak situation because I have felt that this may have been what you had in mind when you invited me to read this paper. If I am correct in this, I can tell you that you are not alone in your desire in this direction. It may surprise you to learn that we have in turn received requests for off-peak rates from general manufacturing companies, storage battery charging stations, ice and refrigeration plants, electric sign companies, theaters and others.

In each case, we are told that the particular load comes just before or just after the time, the particular customer has decided that our peak occurs. None of these requests has been upheld by the facts in the case. Our peak occurs more often at nine o'clock in the morning than it does at six o'clock in the evening. Our June 10 a.m. peak has exceeded our February 5 p.m. peak.

Our load is a combination load. We are not a lighting company. In the daytime we have the office building transportation and lighting load, the hotel cooking, refrigeration, transportation and lighting load, the residential cooking and appliance load and the industrial power load. As dusk appears, we lose a portion of the daylight load and substitute the home-lighting load. A few hours later we have the theater and amusement load and throughout the night carry the street lighting, electric sign, battery charging, a part of the industrial power and a constantly growing industrial heating load.

It is partly due to the interlocking of these loads that your low cost of electricity is made possible. One class of customer helps all other classes to enjoy lower rates. All benefit by the increase in the number of classes of loads we acquire, thereby permitting us to improve our load factor. It is the distribution of fixed charges over all of these customers in a fair proportion that makes our service low in cost. Certainly the fair thing to do is to make each class of customer bear its proper proportion of cost. No class of customer should be served at a loss to be made up by other customers.

Not only is this the fair method but it is required by the public bodies that have been set over us. In St. Louis we believe that we are doing this, as indicated by the following table in which the average cost of residence service is put at a maximum of 100 and each of the other classes of service is rated in the proportion that its average rate bears to the residence rate.

Residence	100
Lighting	79½
Power	56½
Primary power	27½

The difference in the cost of electricity to these classes of customers is due solely to the difference in class costs.

Summary

From the information I have given you, it will be seen that, in communities such as St. Louis, your rate will be based upon three factors, your demand, your hours of use of that demand and the size of your purchase. You will note that these factors are the same ones which would determine your power cost if you operated a private power plant, and it is around these factors that your electric rate is built.

I am not going to hold you longer by a discussion of the forms in which rates may be set forth. Suffice it to say that within every properly setup rate, the three factors mentioned will be covered. Much of the variation in rate forms results from the individual efforts of electric companies to cover these factors in a fair manner and yet have the rate in a form understandable by the average citizen. We recognize the undesirability of complex rate forms and our efforts are being bent towards the simplification of such forms and the dissemination of information about our business among our customers.

It is not possible to reach all of our customers with discussions such as this. If we could, much of the mystery surrounding our business would be cleared. Our customers would understand that the mysterious meter is nothing but a little motor which revolves at a speed proportionate to the amount of elecricity being used and that this little motor is geared to dials which register the number of revolutions.

We would like our customers to know that our now meaningless terms are quite often names given to definite things and quantities to honor great scientists who have added the knowledge of these things to wealth and advancement of mankind. We are not in a secret business, all details of it are open to public inspection. We are trying to render to our community a reliable, efficient, economical and courteous service and I am happy to be able to state that our efforts are being increasingly rewarded by the good will and confidence of the community of which we are a part.

Discussion

MR. STEWART: The gentleman did not particularly touch on this point, but I would like to know if you have any rate, in Missouri, considering power factor.

MR. BERRY: Some central stations have now inserted a power factor clause in their rates to compensate for the very poor power factor brought about by the use of oversize induction motors. In some localities conditions are such that a power factor clause is fully warranted, and is in operation, and I think this clause is perfectly fair.

Power factor is probably the most intricate subject of all the intricacies of our business. We send over the lines a number of amperes, and a certain proportion of these are idle and do no work. These amperes cost money to the central station. They burn out equipment; they cause losses and it costs money to supply them. Some central stations compensate for these losses by giving the customer who puts in corrective equipment a bonus or rate reward for the resulting high power factor or by placing a penalty on those who do not put in equipment to improve their power factor. It is a clause that is absolutely fair in principle, and I think that it has been so in practice. You are paying for service based upon the cost of supplying you.

If Mr. "A" has 100-kw. demand on us and has a unity power factor, we put in generator lines and all equipment to supply 100-kw. If Mr. "B" also wants 100-kw. and has a 50% power factor, we then put in generators twice as large, and so on down the line. In addition to this, our operating costs are increased, so that it costs more money to serve Mr. "B" than it does Mr. "A". The condition is such in some communities that they have been forced to insert a power factor clause into the rate.

We hold nothing against the power factor clause, except that it is hard to put into good, commercial language. If we could do this we might possibly go to one right here.

The Application of Electricity in the Crushed Stone Industry

By E. W. Pilgrim

Industrial Engineering Department, General Electric Co., Schenectady, N. Y.

ELECTRICITY, by virtue of its flexibility of application and being a commodity found almost everywhere is acknowledged our greatest and most useful servant.

We must choose what form is best suited for our application and I would recommend the 3-phase, 60-cycle current because this current is practically standard in the United States and electrical manufacturers build motors of these characteristics on a quantity production basis. Therefore, they cost less and are carried in established warehouse stocks at leading centers to render quick service.

Because the location of the machines in the quarry is changed as the work progresses, temporary power lines are required (often most conveniently laid along the ground and the work is mostly outdoors), grounds are liable to occur and a low voltage is essential. I would, therefore, choose 440 volts as the most desirable voltage. Our choice of power then is 440-volt, 3-phase, 60-cycle. How shall we obtain it?

If there are power company lines running near the quarry site so that connections can be made at a moderate cost, purchased power will prove to be the most economical. Continuous operation is assured because the power company has standby or emergency units. You will find that the power company's rate can compete with any type of small isolated power plant except, perhaps, a waterpower at or near the site that can be cheaply developed.

The power company will deliver power at 2300 volts or higher voltage. We must now choose a site for a transformer substation. This location should be near our center of distribution but out of range of flying stone from blasting, and its equipment will consist of:

Galvanized steel tower supporting switches, bus bars, cables, etc.

High tension anchoring insulators for the incoming line.

Air break disconnecting switches.

Choke coils.

High tension expulsion type fuses.

Oxide film lighting arrester with disconnecting switch.

Transformers.

High and low voltage transformer connection busses.

Switch house; consisting of a steel cabinet enclosing a switchboard panel, equipped with watthour meter, overload and no voltage relays and oil circuit breaker.

For the average quarry the transformers would each be 200 kva. capacity or less.

Separate lighting transformer of probably 10 kva.

Lighting

Good illumination is Class A insurance against accidents. Incandescent lights should be so located that they will perfectly light the machinery, and also be placed where they may be renewed and cleaned conveniently. The switch for turning off lights must be handy so that workmen will turn off lights when not needed. Sixty- to 100-watt Mazda lamps should be used, as not

E. W. Pilgrim

enough illumination can be had from smaller sizes after they once are coated with a film of dust. A number of floodlights illuminating the working part of the quarry should be installed, and so arranged that the light from them can be changed as the work of quarrying progresses.

The crushed stone industry in the average plant will have installed about 500-700-hp. electric motors, distributed in about 20 units, and as the ratio of the operating time to the total time is around 80-90 per cent, this makes a desirable load for a power company. The power company will probably have a rule limiting the size of squirrel cage motors to about 40 or 50 hp. Within this limit will fall the motors used for the quarry pump, rotary screens, grizzlies, belt and bucket conveyors and machine shop motors. Squirrel cage type motors are the proper types for these machines. In selecting your motor it is to be remembered that a large uqantity of fine dust is flying about. Some of the motors are installed out of doors, and there is more or less vibration due to the nature of the work. General Electric motors, squirrel cage type, meet these requirements, having cast aluminum rotors or rotors with electrically welded end rings. Stator windings are treated so that they are moisture-resisting. Bearings are dust-proof. Bearings and shafts are large and rugged to withstand sudden strains.

Large dust-tight oil well covers are provided, which, when opened, give a clear view of the oil rings so that it can be readily observed if they are rotating properly.

Conveyors

Continuous conveyors are usually the most economical means of mechanically loading and unloading loose bulk material and for moving them short distances. By the term "continuous conveyor" is meant those types of machines which keep the material moving forward in a constant stream, or in separate amounts following each other so closely that this result is approximated. This class of machines may be divided into three groups, elevating only, elevating and conveying, and conveying only. Machines for elevating only are almost without exception of the bucket type. Machines for elevating and conveying are also ordinarily of the bucket type, either or the V-type bucket or pivoted bucket carrier form. Machines for conveying only include belt conveyors, apron and pan conveyors, screw conveyors, etc. Where material is to be loaded from a storage pile to wagons, a portable conveyor may be used to advantage.

If a conveyor is long or inclined, making it hard to start, a slip-ring motor may be required. This type of motor has the rotor windings insulated and connected to collector rings and through brushes to a controller. It has high starting torque and does not pull excessive current from the line on starting. If on the inclined conveyors there is a dangerous element introduced by overhauling the motor in case of power failure, the motor should be furnished with a solenoid brake.

Crushers

The crushers, jaw, rotary, gyratory and hammer type, will require the largest motor

running up to 300 hp. These machines require large starting torque under certain conditions; that is, starting up after the machine has been clogged due perhaps to failure of power.

To meet the torque requirements and power company rules if an induction motor is to be applied to crushers, a slip ring type should be chosen. To relieve the motor from shocks and increase the life of bearings, the motor should be belted. With an all induction motor load the power factor of the plant would probably be around 70-75 per cent. This power factor will be undesirable to the power companies so that a synchronous motor should be installed somewhere to better the power factor. The General Electric Co.'s super-synchronous motor has all the characteristics required for a crusher application (high starting torque, high pull out torque), power factor correction, rugged design. The electrical construction and essential dimensions of this motor are identical with the standard synchronous motor of the same rating. The special mechanical features include the suspension of the stator so that it can rotate during the starting period. The periphery of the frame is machined for a braking surface and is fitted with a band brake, lever and quadrant of mine hoist practice.

The motor is a pedestal type machine with two pedestal bearings. Each pedestal carries a bearing which is modified so that the outer part forms the bearing for the rotor shaft, while the inner part carries the bearing for the stator; the stator being supported on a hollow journal fastened to an extension of the end shield.

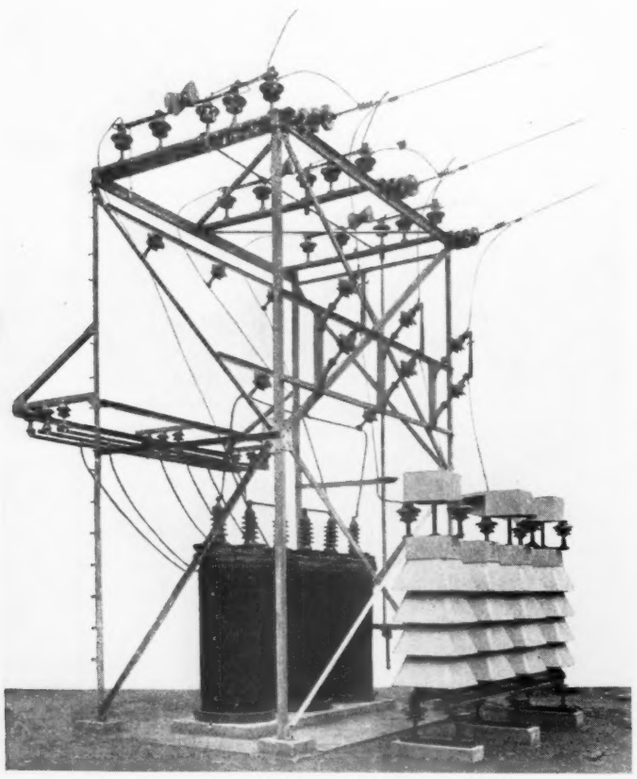
When starting with load, the brake is released, the armature is energized and comes up to induction motor speed. The field (rotor) is then energized and the armature comes to synchronous speed and when in synchronism the motor will exert approximately 250 per cent torque before falling out of step and stopping. Now, by applying the brake the armature can be slowed down which results in the starting and speeding up of the field and attached load. The acceleration proceeds to synchronism proportionally as the armature is brought to rest, that is, the sum of the speeds of stator and rotor always equals the synchronous speed of the motor. When the brake is locked the unit has become a normal synchronous motor.

Throughout the acceleration of the field from zero to synchronism the motor is able to apply torque to the connected load several times greater than its normal full load torque.

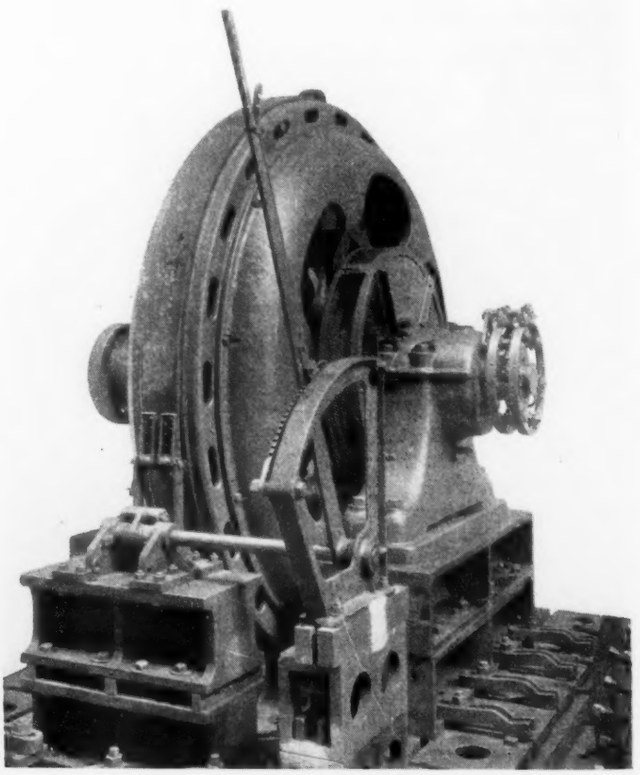
The current drawn during starting bears the same relation to the full load current as the starting torque required bears to the full load torque. That is, a starting torque of 125 per cent full load torque will draw 125 per cent of full load current from the line.

Heretofore when synchronous motors have been connected to loads that could not be relieved during starting it has been necessary to interpose two extra bearings and a clutch of some sort that would allow the motor to come up to synchronous speed while disconnected. The cost of these extra fittings, their weight, the careful alignment required for a four-bearing set and the extra room taken up, have been serious handicaps working against the use of this otherwise very desirable type of motor.

The synchronous motor has 2 to 3 per cent better efficiency than an induction motor of the same rating, with the added advantage of being operated at say—0.8 leading power factor as against 0.85 lagging power factor of the induction motor. This permits power factor correction and raises the power factor of the entire plant which is very desirable.



Outdoor station—three 33000/2300-volt, 200-kva., 60-cycle, oil-cooled transformers with disconnecting switch and oxide lightning arrester

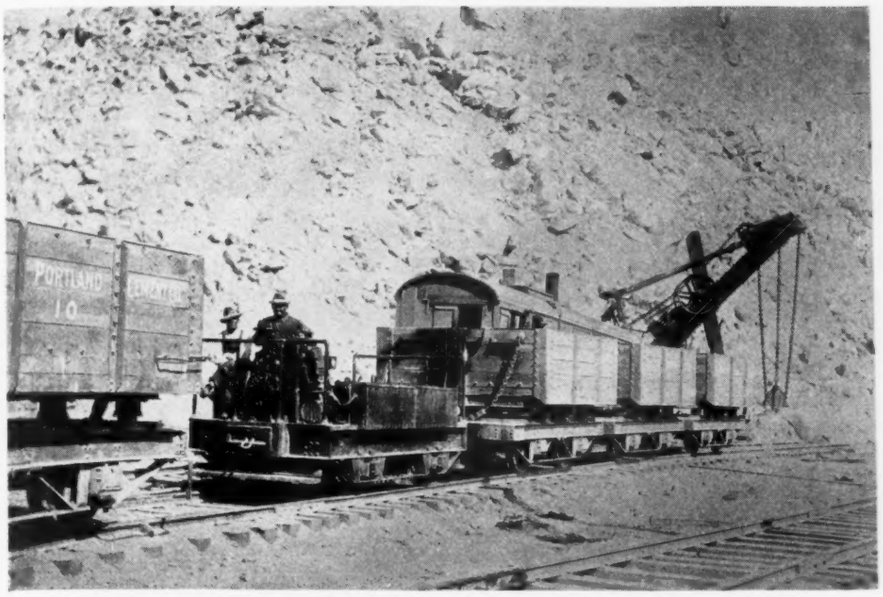


A 450-hp., 187.5-r.p.m., 3-phase, 60-cycle, 2200-volt synchronous motor with revolving stator showing collector rings and break mechanism

Quarry Machines

The next step is to electrify the machines in the quarry. First, we have the drills for blasting. These machines will be portable and an adjustable speed motor will be required since speed must be lowered as the depth of hole increases; 10-15 hp. motors are applied to these machines.

It will be found advantageous to have a portable air compressor to supply air for small drills used in breaking up the large mass of rock into sizes that can be handled by the crushers. A 25-hp. squirrel cage mo-



Storage battery locomotive at the quarry of the California Portland Cement Co.

tor would drive a compressor of sufficient size to handle one drill.

For the ordinary quarry, it is usually desirable to take the stone either direct or after it has been shot, from the face and load it into mine cars with some form of power shovel. The advantages of electric drive over steam for this work are quite marked, especially where the operation is intermittent and shut-downs of 30 minutes to one or two hours are liable to occur, the electric shovel is at a decided advantage on account of the fact that it can be shut down completely and will not use any power, whereas, the steam machine would have to stand with the fires banked and would be using fuel. An average quarry would want to load in the neighborhood of 800 cu. yd. of rock in a 10-hr. day. To do this against a fairly stiff bank would require a shovel with about a 1½-cu. yd. bucket. A suitable shovel would be one of the full revolving type having a fairly high and wide reach, and fitted with a modern caterpillar traction, giving it a very wide range of operation. One of the big advantages of caterpillar traction is that the pit gang can be reduced to a minimum, thereby cutting the operating expense.

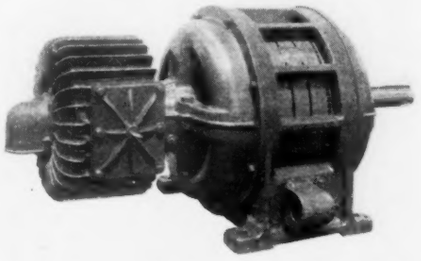
This type of shovel will work rapidly in comparatively hard digging and can load accurately into cars with minimum movements of the loading track. It can be equipped with various types of dippers and booms to suit special local conditions.

Power supply is brought up to the shovel by a flexible cable about 500 ft. in length, which trails after the shovel as it moves. The equipment on the shovel will be as follows:

Hoist Motor—One 75-hp., 230-v., 485-r.p.m., series wound mill type motor.

Swing Motor—One 20-hp., 230-v., 725-r.p.m. series wound mill type motor.

Crowd Motor—One 20-hp. 230-v., 725-r.p.m., series wound mill type motor with waste packed bearings.



A 440-volt induction motor with cut-side enclosed collector

Hoist Control—One drum controller with vertical handle, one magnet valve, one protective panel.

Swing Control—One drum controller with vertical handle.

Crowd Control—One drum controller with vertical handle, one magnet valve, one protective panel, one combined register.

Motor-Generator Set—This set will consist—50-kw., 1200-r.p.m., 250-v., S.W., generator, direct connected to 75-hp., 1200-r.p.m., 440-v., motor, forming a 2-unit, 3-bearing set with base. Motor equipped with end play limiting device.

For controlling motor generator set: One starting compensator, 1 disconnecting switch, 1 generator field rheostat.

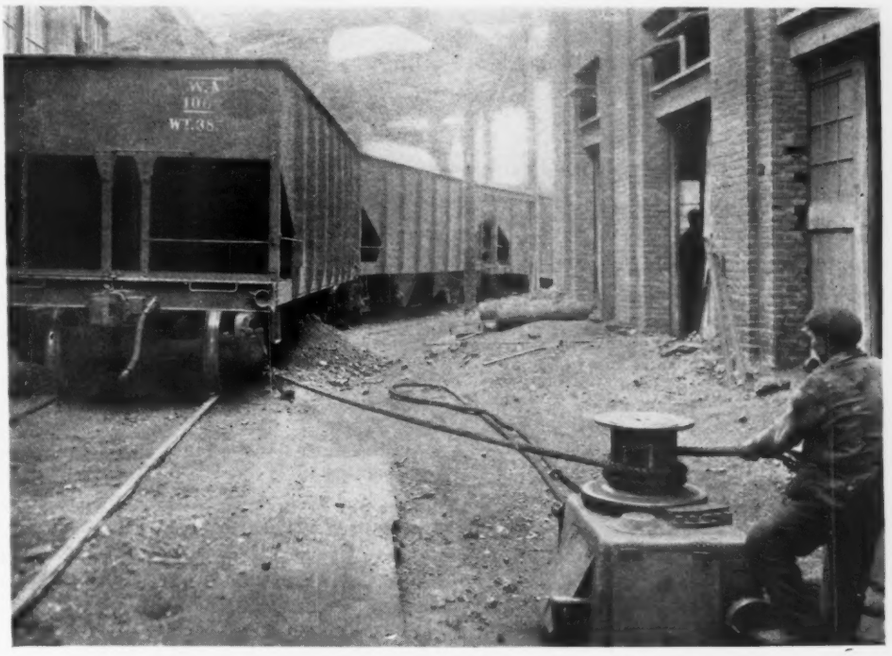
The functions of the hoist, swing, and crowd motors and controllers are evident. The magnet valves listed are used to control the mechanical brakes on the various motors. Tests have proved that air brakes are superior to electric brakes for this service. The protective panels on the hoist and crowd motions furnish an automatic form of protection to prevent burning out the motor when stalling conditions are encountered. The function of the motor-generator set is to convert the alternating current power brought to the shovel into direct current, which it has been found is the most suitable form for operating the motors which are geared directly to the various motions.

Tests show the following comparative results on cost of operating shovels:

	Per cent
Steam	100
Gasoline-electric	86
Electric	76

Transportation

Stone can be hauled from the quarry to crushers by storage battery locomotives.



Electically-operated vertical winch for spotting freight cars at plant

These locomotives are equipped with long life batteries, and are highly efficient. One of the big items of expense in each ton of stone is the haulage charge. The storage battery locomotive reduces this expense by its ease of operation and low center of gravity, which allows maximum speed on tracks that are often uneven.

The storage battery locomotive makes grade and hauls heavy loads easily. They are provided with batteries, the upkeep and repair cost of which is extremely low. There is always extra power when necessary to couple on an extra car.

For spotting cars the General Electric Co. manufactures an electric winch as a complete self-contained unit, having all gears, motor, controller and resistance enclosed in the winch base, the unit is compact and especially adapted to out-of-door service.

When visiting crushed stone plants you will, no doubt, observe that the motor equipment is not exactly as described above, perhaps only part of the machinery is electrified. Each plant requires specific treatment and modifications must be made, not always the best, but to meet local conditions. I have endeavored to place before you a target to shoot at—hit the bull's-eye if you can.

Discussion of Mr. Pilgrim's Paper

MR. BAMBERGER: Mr. Pilgrim mentions 440-volts as the most desirable voltage. What advantage is it to the consumer, aside from the first cost of installation? Is there any other advantage to the consumer?

MR. PILGRIM: First cost is one of the chief advantages; 440-volts is chosen to reduce the wire as much as possible, and low voltage to protect the workmen. The 220-volt motors can be reconnected for 440-volts and you can get 440-volt motors quickly if you need another motor in a hurry. It is a standard motor of a low voltage, yet high enough to reduce the wiring costs. A good many of the wires are laid around on the ground. This practice would make a high voltage dangerous for the workmen. We do not have the highest class of workmen, and it is very possible that they are likely to be electrocuted. Furthermore, you have to have some 440-volt, because the small-sized motors are not built for higher voltage.

MR. STEWART: Before I ask this gentleman a question, I want to tell you of a little experience that we have had. At certain times around the plant we have noticed quite a few of our lights disappearing, and of course while we consider our quarry workmen honest, we did not know whether it was our workers or not who took these lights. One of these lights would go into a dinner box and that would be the last we saw of it, so we conceived the idea of changing our lighting to 220-volts. After that a person would take one but he would not take any more. But we soon found out that the 220-v would not stand up under the vibrations, and I would like to know the size you use in your plants. We decided to get a light that would stand up under wear and thought it better to change back to our former light and run the chance of losing some.

MR. PILGRIM: The 220-v lamps are liable to breakage, due to vibrations. Furthermore, it is not a standard lamp and you cannot buy them in the open market. You have to order them special. So it seems as though you will have to figure out that you are going to lost so many every year.

MR. HUME: Regarding the lamps disappearing, I happen to know of a number of manufacturers who had lights and sockets manufactured that could not be removed except with a key.

MR. STEWART: Generally, in a case like that, I find that we lose the socket and light, instead of just the light.

CHAIRMAN SCHMIDT: For further information, I would say that we use the 220-v light and we purchased the mill type lamp from the General Electric Co. However, they will burn out a good deal quicker than the others for some reason or other. I hope that there is a lamp that will answer the purpose better.

MR. BERRY: The 220-v lamp does not have the life that the 115-v lamp has. Aside from the question of theft, you will get much better service, much better light and much better satisfaction in every way out of the 110-v. lamp, than you can ever get out of the 220-v. The 220-v lamp has not the life under ideal conditions, will break quicker, and has, I think, less efficiency. Many manufacturers who have tried out the 220-v lamp have gone back to the 115-v lamp.

Promoting New Shearer Concrete Tie

H. E. PARKER, head of a brokerage house in Chicago, has been in Bloomington for the past few days, discussing plans for the organization of the promotion end of the United States Indestructible Tie Co., with the inventor, F. C. Shearer. He will return to Bloomington shortly and they will go ahead with the financing of the company for the manufacture of the new product.

According to Mr. Shearer, the tie is meeting success in several places. He states that ties have been shipped recently to Nebraska, where they are to be given a trial. He has recently received a letter from the Portland Cement Association in which they compliment him on the work he is doing in connection with his ties.—*Bloomington (Ill.) Bulletin.*

[The Shearer concrete tie was described and illustrated in the February 23 issue of Rock Products.—Ed.]

Linwood Cement Co. to Build Plant at Davenport, Ia.

PLEDGING an additional $100,000 in capital stock, stockholders of the Linwood Cement Co., of Davenport, at the annual meeting approved the project of the company for building a plant on the company's property at Linwood, and authorized the board of directors to proceed with the plans and to issue bonds at any time the board sees fit to raise additional funds to make the project a reality. This action was taken at the meeting after Chicago financial interests and cement experts had given their approval of the project.

The present board of directors of the company was re-elected at the annual meeting. The directors are: A. E. Horst of Rock Island, A. E. Carroll, C. C. Hagermann of Muscatine, A. C. Klindt, Dr. Frank Neufeld, E. R. Schroeder, William Goetsch and J. F.Schroeder.

The stockholders heard reports of one of the most prosperous years experienced by the company. When officials of the company reported on the project to build a cement plant, it was received with enthusiasm and the stockholders favored the issuing of more stock. The company now has a capital stock of nearly $500,000.

It was reported at the meeting that two projects were being considered. One is the construction of a $2,000,000 plant with the help of outside capital. The second is the building of a plant costing $1,000,000 and having a capacity of 1200 bbl. daily. It was reported that the quality of the Linwood rock was such that shipments for chemical purposes had been made to Western cities, 1000 or more miles distant, in preference to similar rock secured in other sections of the country. That the Linwood ledges are sufficiently drained and well situated to permit their being worked for cement rock, was the opinion of outside cement experts whose reports were given at yesterday's meeting.—*Davenport (Iowa) Times.*

Planning to Open Texas Potash Deposits

TEXAS papers announce that Will A. Miller of Amarillo and Charles W. Dabney of Houston, Texas, who have been interested for several years in the possibility of profitable development of potash deposits in West Texas, have been furnished an encouraging report from the American Association for the Advancement of Science, and plans are under consideration for a thorough working of the field from the North Plains to the Midland territory, where potash deposits have been found at from 1100 to 2300 ft.

Symposium—Drilling and Blasting

Some Fundamentals of Big Blast Hole Drilling for Quarry Work

By M. B. Garber
Sanderson-Cyclone Drill Co., Orrville, Ohio

WHEN the well drill was being introduced to quarry work it was necessary to demonstrate to quarry operators the advantages of big hole drilling and blasting.

That day is past. Today, the well drill or big-hole method of drilling and blasting, as a method, is an accepted fact and the quarry drilling problem has narrowed down to the matter of obtaining the lowest possible drilling and blasting cost per ton of material excavated.

In many quarries, especially those producing hard rock, drilling, is the most difficult and perplexing operation, possessing what may be termed, intangibility, or the inability of being quickly remedied when difficulties are encountered.

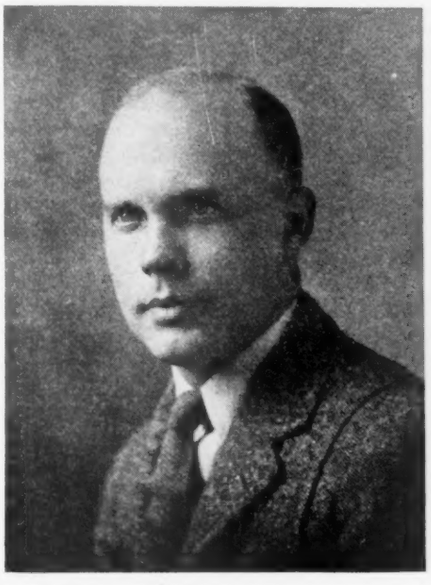
For the reasons just given, no quarry man should be without a good working knowledge of the operating fundamentals of big blast hole drilling, and their application to his own particular rock moving job, all of which has to do with the putting down of holes in the best, cheapest and quickest way possible and to do this so that nothing else on the flow sheet will suffer. Very little has been written on this particular subject to date. Most of the information has been passed around from mouth to ear, or each quarry has worked out its own problems to a certain degree.

It will therefore be the purpose of this discussion to endeavor to offer some suggestions on certain phases of quarry drilling concerning which, through experience gained in serving the field, it has been found that knowledge and understanding is somewhat generally lacking.

In passing, it might be said that, in arranging an operating program and in the deduction of final costs, drilling and its affiliated operation, blasting, must be considered together. This refers to the diameter, spacing and loading of the holes and the strength of explosive to be used, but blasting has no interest in how the hole is going to be drilled as long as it is there and ready for the explosive, nor has drilling, in itself, any concern how the explosive will get in the hole and how it will be fired. Thus considered, the two are entirely separate and individual. It will be well to keep this distinction in mind, because it will be the purpose to confine this discussion as much as possible to drilling alone.

Drilling divides itself logically into the following elements:

(1) The proper balancing of the drilling equipment for the particular job, which must be considered under two heads, namely, the drilling tools and the drilling machine.



M. B. Garber

(2) The efficient operation of the equipment.

(3) The care and upkeep of the equipment.

(4) The handling of special conditions and problems.

In a discussion of this kind it is difficult to follow such an outline rigidly because the elements interlock and bear on one another in such a way that separate or individual treatment is impossible. For this reason it will be best to first consider the drilling tool equipment and then the machine — mentioning things regarding their selection, proper operation and care, as we go along, and later take up the handling of some special drilling problems.

Importance of a Properly Balanced Tool Equipment

In big blast hole drilling, which, defined, is an application of the cable tool system of well drilling to heavy rock excavation the drill hole is made by the alternate lifting and dropping of a heavy bar with a cutting end, which forms the drilling tools. As much, or more, hole is made due to the crushing effect of the heavy bar as results from the chopping action derived from the sharpened cutting end which is known as the drill bit.

Therefore, three basic conditions are important in the makeup of the quarry drilling outfit. First, to have tools of sufficient weight to secure a good crushing action. Second, to be able to lift and drop the tools at sufficient distance to take full advantage of the crushing action derived from the heavy weight of the drilling tools this being the problem of the mechanism of the machine which operates the drilling tools. Third, to have a drill bit of the proper material and properly sharpened for the stone being drilled.

Considering first the drilling tools, you quarry men know that 5⅝- to 6-in. holes are considered more or less the standard for big-blast-hole drilling in what may be termed the average quarries, which, for clarity, may be described as limestone, dolomite or sandstane operations carrying working faces ranging from 20 to 25 ft. up to 100 ft. in height and producing from 300 to 10,000 tons of crushed stone per day.

Present practice recommends for this average quarry a drilling tool equipment weighing approximately 1250 lb., consisting of a drill bit weighing about 200 lb., a drill stem 4¼ in. in diameter by 20 ft. long weighing about 960 lb. and a rope socket weighing about 90 lb. A few years ago the common practice for the same work was a drill stem 3¾ or 4 in. in diameter and from 16 to 20 ft. in length making a tool equipment varying in total weight from 850 to 1000 lb. It has been proven very conclusively that the extra 250 to 400 lb. will add from 25 to 40% to the drilling speed.

A very concrete example of this is a large stone quarry in Iowa where within

the last 12 months by changing from drill stems 4 in. to stems 4¼ in. in diameter and by making some adjustments on the machine it was possible to increase their daily footage from 35 ft. per 10-hr. day to 65 ft. per 10-hr. day with practically the same drilling outfits that had been operating for 12 years. Another instance is one of the largest stone operations in the country who increased their drilling footage from 4½ ft. per hour to an average of nearly 8½ ft. per hour by replacing 3¾-in. by 20-ft. drill stems with 4¼-in. by 20-ft. drill stems and insisting that these drilling tools be operated at 58 to 60 drilling strokes per minute instead of 50 to 52 strokes as had been the case in the past.

We mention these two instances because many quarry operators who are still using the lighter tools could lower their drilling costs by changing to larger size tools the next time they find it necessary to order replacements. That is, providing the drilling machines which they have are of proper size and properly powered to handle heavier tools.

Experience so far indicates that drilling tools of the size and weight just mentioned, namely about 1250 lb., are as heavy as should be recommended for the ordinary quarry of the characteristics as previously described, and it is very improbable that the future developments will prove that the use of much heavier drilling tools would be practical because as the weight of the drilling tools is increased, the weight and strength of the drilling machine that operates them must be increased proportionately, Thus, a point is reached in the weight of the entire drilling outfit which affects its portability and determines whether or not it can be quickly and economically moved from hole to hole and will not be cumbersome and unwieldy. Furthermore, holes 5⅝ or 6 in. in diameter have proven satisfactory for blasting purposes, allowing ample room for column loading of explosives and, when properly spaced and loaded with regard for local quarry rock formation, give very good all-around results.

Quarries producing hard rocks such as trap, granite and quartzite and certain open-pit mines where the ore is found in hard igneous and metamorphic rocks have been the object of an interesting drilling development during the past 18 months. Drilling tools weighing from 1800 to 2000 lb., consisting of drill stems from 4¾- to 5-in. in diameter by 20 ft. in length with drill bits for drilling holes 6½ to 8 in. in diameter, have been used with good results. Incidentally, these larger tools have necessitated the manufacture of a somewhat heavier drilling machine to carry them. The purpose of this larger and heavier drilling equipment has been to overcome the difficulties encountered in drilling holes in these hard and abrasive formations which are usually full of crevices and seams running in all directions. The large diameter of the tools prevents them from drifting and also tends to prevent breaking at the joints should they become fast. The greater weight adds to the drilling speed. The larger diameter of the holes accommodates more explosive so that, in most cases, wider spacing of drill holes is possible, which, of course, means less linear feet of drilling per ton of rock moved. The greater total weight of the entire equipment decreases its portability, but this is not such an important consideration as, on hard rock propositions, the drill usually remains on one location a considerable length of time due to the slow progress made.

Care of Drilling Tool Taper Joints

Having considered, briefly, the general characteristics of a well balanced blast-hole drilling-tool equipment, let us proceed to some of the details in the make-up of the tools that have a great influence on successful operation and, first, take up the taper joints that are used in connecting the several sections of the drilling tools.

Too much care cannot be given the taper joints. Experience has shown that joints are often spoiled either through a lack of understanding or through carelessness, and this is often a source of expense and inconvenience in the operation of a blast-hole drilling outfit.

When new drilling tools arrive on the job the joints will always be well greased in order to prevent rusting. Before using the tools, all of this grease should be removed and the threads carefully washed clean with gasoline or kerosene. Then a little water should be put on the threads each time they are drawn up, which will furnish all the necessary lubrication. It is impossible to set a taper joint with grease on it. On a number of occasions calls have been made for factory or drill experts to come to the quarry to investigate imperfect joints or trouble in joints coming apart and invariably upon examination it was found that the cause of the trouble was that the grease had not been removed from the threads.

It is extremely important that new joints be properly broken in or set. This process will take from several hours to a week, depending on the hardness of the rock and also somewhat on the steel in the joints. The first time new joints are put together they should be screwed no tighter than one man on the end of the wrenching bar can pull them, exerting a reasonable amount of strength. It is a good idea at this time to take a punch or cold chisel and mark both collars for future reference. This will not be a final reference mark because after the tools are in operation for a while it will be found possible to set them up closer due to the fact that the shoulders of both the box and pin collars are compressed by the heavy pounding and, unless the joint is tightened again, the threads alone will be carrying the strain of the connection instead of the shoulders. For this reason, it is necessary to watch new joints carefully and at frequent intervals tighten them to prevent them from coming unscrewed in the hole. On hard rocks like granite, trap and some limestones it will be found that the marks made on the collars will be one-fourth to two-thirds of a turn from one another after the joints are properly set, while on softer material the marks may not be more than one-fourth to one-half inch apart. It is then a good idea to re-mark the joints for final reference, providing they cannot be tightened more.

To give an idea of how much the shoulders of a joint will compress and the reasons for carefully setting a joint, if you will examine the pin of a new drill bit, there will be found a small groove or chamfer at its base on the shoulder, if the joint has been properly made. This chamfer should be cut on a radius and should be from $^1/_{32}$ to $^1/_{16}$ of an inch deep and $^1/_8$ to $^3/_{32}$ of an inch wide. After the joints have been properly set and the tools have been in operation for some time this groove will gradually disappear.

After joints have been used for a while the abutting shoulders will sometimes become rough and burred on the edges. A straight-edged pumice stone should be kept around the drill for the purpose of dressing the shoulders perfectly smooth and for grinding off the burrs to prevent them from turning in on the shoulders and making it difficult to tighten or loosen the joint. A file should never be used because it cuts too rapidly and leaves marks which tend to cause the shoulders to roughen again when setting up the joints or to make the shoulders uneven.

A common mistake in handling joints in quarry work is to try to screw them too tight. Every now and then one may see two or three men on the end of the wrenching bar, attempting to tighten the joint. Sometimes they even go further and try to secure additional leverage by putting a long piece of pipe on the end of the bar. This will result in pulled threads and a joint that will come loose in the hole much sooner than a properly set joint. In fact, a joint that has been properly broken in in the beginning will not come loose in the hole.

Double Box Joints on Drill Stems

In blast hole drilling, the joint that takes the most severe punishment is the box joint on the drill stem which connects with the pin joint of the drill bit. As this joint bears the bulk of the vibration and due to the heavy hammering action of the drilling motion, there is a tendency for the steel in this joint to be-

come fatigued and eventually fail. It is this joint that will require the most frequent repairs. On hard rock or even rock of medium hardness, drill stems fitted with two box joints, that is, a box joint on either end, are found to give double life and result in great saving in tool repair costs. When stems of this kind are furnished, the rope socket must be fitted with a pin joint instead of a box joint. With the two-box joint construction, the stem is changed end for end at intervals, thus allowing the fatigued steel in one box joint to rest while the other box joint is in strenuous use.

The Shape of Drill Bits

The most important single item of a quarry drilling tool equipment is the drill bit, as there are many things about it that have to do with successful blast-hole drilling. There are several patterns of drill bits, the one that is most often used in quarry work being the regular pattern or what is commonly known as a chisel bit. There is also a four bladed or cross bit known as a star bit that is sometimes used for creviced rock, although a thick bladed chisel bit often will give equally good results, provided the cutting edge of the bit is properly shaped and the tools are properly operated.

The shape of the cutting edge of the drill bit is one of the important factors in making hole, and on it depends whether or not any advantage is to be gained through the chipping action or whether all must depend upon the crushing action of the weight of the tools. Quarry drillers who sharpen bits at the drilling machine as well as local quarry blacksmiths have developed a greater variety of cutting edges on well-drill bits than there are pages in Noah Webster's masterpiece. However, it is not possible to lay down infallible rules in regard to the proper shape of the cutting edge of the bit for a given kind of rock. This is even true of rocks of the same geological family, due to the fact that their drilling or chipping qualities will vary greatly. It is necessary to experiment, and then having obtained a shape that gives the most footage to insist upon uniformity thereafter in sharpening bits.

On the other hand, there are certain general principles governing the shape of the cutting edge of bits that must be followed if maximum footage is to be secured. The water channel must be kept clean. The cutting edge should be straight tending toward a little concave, but, under no conditions convex. The bevel or angle between the surfaces forming the cutting edge should be determined by the chipping qualities and hardness of the rock.

When drilling in abrasive and in hard rocks the bit must be dressed with heavy shoulders on the edges of the blade above the corners in order to maintain the shape. In addition in abrasive rock or where there is a tendency for the tools to drift, the cutting edge should have heavy wearing surfaces. A wearing surface is made by pulling out the upper edges of the beveled faces so that they almost fill the hole. It should be mentioned though, that if the rock is only hard and not abrasive, a wearing surface is a positive disadvantage because it furnishes additional friction in the drop of the tools and also causes more or less of a plunger action.

For most soft formations, very little or no wearing surface and shoulders are required. The corners of the cutting edge should be drawn out thin and sharp, making what is known as a feather edge, so that the bit will not stick as it plunges into the material. The degree of bevel will vary from very sharp for shelly rock like slate and some hard shales to almost blunt on extremely soft formations where the drill bit plunges forward more quickly than it is possible to mix the material into a sludge.

It is hardly necessary here to say anything about the heating and tempering of steel, as most every quarry man is well grounded upon the fundamentals through experience with small drill steels.

Drilling Jars for Blast Hole Work

Another drilling tool that is employed occasionally in big blast hole drilling is known as drilling jars. Jars are built in the form of a heavy link which construction provides a means of striking a strong blow in an upward direction whenever the drilling tools become caught in the hole. They are not a part of the usual blast-hole tool equipment and are to be recommended for quarry work only in hard and creviced rocks when the quarry face is over 50 ft. in height where they must be considered as a necessary evil but very often are preventive of a great deal of trouble.

Care of Drilling Cable

Before leaving the discussion of drilling tools, one or two suggestions might be made concerning the proper handling of Manila drilling cable which will tend toward increased service as drilling cable is one of the important items of expense of a big blast hole drill.

The most economical length of drilling cable to use is one approximately 75 ft. longer than the depth of holes to be drilled. This length permits the cable to be turned end for end when the end next to the tools becomes worn and also allows the making of several splices.

When rope is spliced, a long splice should be made even though it does take more rope and sometimes a little more time. A short splice is hard on the rope guards and sheaves, especially the latter as it crowds and often bursts the sides of the groove, being too large in diameter to pass through the throat of the sheave.

Lots of drill rope is worn out every year, not through the strain of drilling, but back at the cable drum where the rope takes off to the spudding device. There is always some vibration of the cable at this point and due to the top wrap of rope wedging down between the coils of the next layer, the constant rubbing or friction burns the rope. To eliminate this wear, a cable divider should be placed on the drum so that the unused part of the rope is coiled on one side of the drum while on the other side only enough rope should be spooled for feeding off in hole and in only one layer. Furthermore, it is important that the surface of the drum be smooth.

It is very necessary that the proper tension be kept on the drill rope while the tools are in motion. The tendency of most drillers is to run with the rope too slack which causes excessive vibration and internal friction that results in the rope being burned out in the heart and in it giving only about one-fourth to one-half the service that it should give. Drilling on the "spring of the rope" is the term used when the proper amount of tension is being maintained in the cable in order to secure the snappy blow that gives the maximum footage. To determine the amount of tension stop the tools on the down stroke just as they are striking a blow, then raise them from 1 to 3 in., depending on the depth of the hole and put them in motion again. Once in a very great while, drill men will run with too tight a rope which results in all the spring or stretch and life being taken from the rope.

Hitting the Bottom of the Hole

In addition to drilling on the spring of the rope, the drilling machine should operate the drilling tools at a speed of 55 to 60 strokes per min., 60 strokes being considered as the desired speed if there are no seams or crevices in the rock and the holes do not exceed 50 ft. in depth. Furthermore, the longest stroke of the drilling crank of the drilling machine should be employed. By drilling on the spring of the rope and at the proper speed, the drill cuttings and sludge are always churned up and in suspension, thus permitting the drill bit to hit a clean as well as a snappy blow on the bottom of the hole. Otherwise, the cuttings tend to act as a cushion which hinders the drilling progress in two ways: First, as the tools do not hit the bottom of the hole, the hole is not advanced. Second, the abrasive effect of the cushioning on the drill cuttings wears the bit steel and cuts the gauge on the drill bit much faster than does solid rock itself.

From what has just been said, it can be seen that bailing or cleaning of the hole must not be neglected. The frequency of bailing is something that is governed entirely by the nature of the rock being drilled. For practically all quarry drilling, the ordinary dart valve type of bailer is all that is required. This is the type of sludge pump that is usually furnished. When drilling in sandstone or in hard and abrasive rocks or

rocks which contain a large amount of minerals which will not form a sludge and in which the cuttings settle rapidly to the bottom, a bailing tool known as a vacuum sand pump is sometimes used. A vacuum sand pump is provided with a plunger which operates the full length of the bailer shell and creates sufficient suction to sweep the bottom of the hole clean, drawing all the cuttings and the sludge into the pump. However, even on materials of this kind, many drillers prefer to use the ordinary dart valve bailer and secure their sludge by mixing soft coal or stiff clay in the hole in order to keep the heavy cuttings in suspension.

It might be mentioned at this time that the sludge of certain sandstones such as are used in making molding sand and also of limestone containing silicious matter have the characteristic of settling very quickly. In such formations precaution must be taken not to allow the drilling tools to rest at the bottom of the hole because the quick settling cuttings or sludge will cement them tight in the hole in a very few seconds.

Handling Seams, Crevices and Crooked Holes

This leads to the handling of special or rather unusual problems that are encountered in quarry drilling. Many of these problems are more or less common to several kinds of rock while, on the other hand, there are quarries whose rock formations are such that none of these difficulties will be met.

In thinly stratified limestones and in metamorphic and igneous rocks such as traps, quartzite and granites where the cleavage lines are close together alternate layers may vary in hardness. When the drill bit breaks through from one layer into a softer one, there is an inclination for the tools to stick. This can be offset by keeping tight tension in the drilling cable. It is also absolutely necessary that the drilling tools keep turning, otherwise the bit will drive down into the softer material and drill ahead without turning. This will not only result in a flat hole, but it may cause a crooked hole.

Such conditions prevailing where the stratification or cleavage lines lie at a high angle approaching the vertical, the dangers are very much increased as the bit will cut the softer layers first, the tools will be deflected to the softer side and will either be stuck or a slanting hole will result.

If there are open joint planes or crevices in the rock as so often occur in granite and trap rock and in the limestones of the Appalachian district, much the same troubles are encountered only often in an aggravated form, as the tools will drift into an opening before the driller is aware that anything is wrong.

Before mentioning remedies for these conditions, the preventatives should again be emphasized.

First: The drill man must be on the alert every moment the tools are in motion with his hands on the drilling cable so that he knows what is going on.

Second: The drilling cable must be in proper tension.

Third: The tools must be kept turning.

Assuming that the drilling tools have become fast in a crevice while part of the stem and rope socket are still out of the hole, they can be very often loosened by taking a tight strain on the drill rope, going up on the derrick, putting a tool wrench on the top square of the tools and then hitting the wrench with the sledge in the same direction that the tools are tightened.

The method of loosening fastened tools after they are below the surface is to take a strain on the drilling rope, place the bumper or jar knocker which is furnished as part of the equipment on the sand line and lower it down to the top of the rope socket. Then, by hand, pull on the sand line so as to raise the bumper 1 ft. to 18 in. and strike light blows. This will very often release tools unless they are extremely tight. If this does not loosen them, the next proposition is to run the bumper up and down on the drill rope by pulling up and releasing the sand line. This however, is hard on drilling cable.

Both of these ways of loosening the tools having failed, a fishing job is at hand and it will be necessary to cut the rope at the top of the rope socket and apply fishing tools consisting of long stroke fishing jars and a combination socket.

If the crevice or crooked hole is discovered before the tools become tight in the hole, the tools should be hoisted and some method applied immediately for the purpose of eliminating the crevice or for straightening the hole. There are several ways of doing this. One way is to put foreign material in the hole, such as cast iron and small pieces of steel. If cast iron is employed, start with one piece a little smaller than the fist and drive it down into the drill hole. If this does not seem to do any good, put in two or three more pieces. However, as little cast iron as possible is best — just enough to carry the tools so that they can get a hold on the rock and pass the crevice. The bit should be dressed so that it is very blunt but with a full wearing surface. The iron and steel will keep the bit working at one point a long time, thus giving it a chance to take hold of the rock and it will also force the steel and iron out against the sides of the hole with such force that it will chip away the rock thus assisting the bit to "eat out" the crook.

Another method of correcting a slanting hole is to fill the hole up past the crook with small pieces of rock or boulders. If pieces of conglomerate known as niggerheads are available, they are excellent for this purpose. It is necessary then to drill these pieces of rock out.

Still another way of straightening the hole or passing a crevice is to drive a block of timber of such size as just about fits the hole down past the crevice of the crook in the hole. After the timber has been seated, the drilling tools are placed in the hole and the block drilled out. The tools should be run on a very tight cable and with the bit dressed blunt. A piece of green oak is best for this purpose. This method is best adapted for rocks of medium hardness.

If a stubborn crevice or crooked hole is encountered and one or all of the above methods have been tried several times and have failed, the desired results can often be obtained by firing several sticks of dynamite in the hole. Anywhere from 5 to 50 lb. may be used although as little as possible to secure the necessary results should be used as an excessive amount will shatter the hole very badly and be a menace to the tools in proceeding with the hole because the shattered fragments may fall in and around the tools.

In very hard or abrasive rock where it is necessary to carry blast holes to considerable depth and there is a great deal of trouble in holding the gauge on the drill bit or in other words, maintaining the original diameter of the hole, it is a good practice to "burn" the hole before putting in a freshly dressed bit. This can be done by pumping the hole out absolutely clean and throwing in ½ to 1 lb. of dynamite and a couple of buckets of water on top of it to hold the shot in the bottom of the hole. The action of the small amount of explosive will enlarge the hole enough to take care of any loss of gauge on the previous bit. Many fishing jobs are the result of a freshly dressed full sized bit being placed in a hole that had become tapered due to running the previous bit too long and allowing it to become undersized.

Sometimes very large openings in the nature of caves are encountered in the path of the drilling tools and the hole can only be continued by letting sufficient slack on the cable to allow the tools to just touch the bottom of the cave and then operating them at a slow speed until a depth greater than the length of the drilling stroke has been reached. Should the cave or open space be greater than the full length of the drilling tools, a great deal of care must be exercised to see that the tools make a start below plumb or in line with the hole above.

In closing, particular emphasis should be laid on the importance of the human element in successful blast hole drilling. The drill man on any quarry job is the most important factor in the entire drilling and blasting operation, and on many quarry jobs the drill man is the element that is going to make or break successful drilling. Where only one drill is operated you can afford to consider the driller as one of the semi-skilled laborers—in the same class as a shovel crane man or a dinkey "skinner." Where there is more than one drill in operation there should be a drill foreman in charge of all the drills and, perhaps, the shooting. He should be an experienced driller and capable to instruct and supervise

other men as drill runners, who may be placed on a lower labor scale. In any event, the drill men should be put on a basis where they will take some interest in their work. It is often a very good practice to pay a drill man certain set wages per day based on so many feet drilled. Over and above that number of feet, pay a bonus of so much per foot, or put him on a straight footage basis. The only possible danger on a proposition of this kind is with the up-keep of the equipment, so it is important that the man or men be of a type who will not neglect the equipment in order to make more hole and work for his own interest entirely.

Standardization of Drill Joints and Properly Balanced Tools

By Fred A. Gill, Lebanon, Pa.

PERHAPS everyone here is familiar with the method of putting together what is called a "string" of tools for drilling blast holes, but should there be one who does not understand, may I mention that it is customary to have on the bottom what is termed a "bit" which does the cutting and directly above that is what is termed the "stem" which is a long bar of round iron, used to provide the necessary weight to drive the cutting bit. Above that is sometimes used what is termed the "drilling jars" which is really the hammer in the hole and used principally to knock the bit loose should it stick. Directly above this is the rope socket, to which is attached the rope that runs up to the derrick. Frequently, in drilling blast holes a set of jars is not necessary; in fact, I would say that 90 per cent of the blast holes which are drilled are done without the use of the jars.

Now, this so-called "string" of drilling or blast hole tools is attached together. Through this attaching process is a threaded joint. This threaded joint is tapered and carries with it collars and squares, the squares, of course, for screwing together. The prime method of making a joint, such as I have mentioned above, is to force the faces together, the joint holding from the friction of the faces. The tapered joint, such as we have been using, was copied from the drilling practice as used in the oil and gas country. It is not the same with each manufacturer. For example, the so-called 2¼x3¼ taper joint may be furnished by many which would not fit that furnished by other manufacturers, which was largely due to a practice which has not only been followed by our own manufacturers of quarry tools, but was also followed by the manufacturers of tools such as are used in the oil and gas country. To make this more explicit: There have been times that I know of in the oil industry when a machinist and blacksmith would get a few thousand dollars together and open a shop and their first move would be to take, for instance, a joint of a standard that some big company was furnishing and change it perhaps 1/64 in. or 1/32 in., the idea being that it would force those within their district to purchase from them. This was only a dream, because no matter what joint is made, it is very little trouble to duplicate it.

I have mentioned this because I want to call your attention to a movement

Fred A. Gill

which has taken place in the oil and gas country to standardize the cable drilling tool joint, which is the same joint, or presumably so, that we use for blast hole work. In June, 1922, in the city of Pittsburgh, a meeting was called by a representative of the American Petroleum Institute and at this meeting were 23 representatives of 16 factories making the cable drilling tools. Unanimously, this body adopted what is known as the "I & H" joint as a standard for the oil and gas industry and appointed a committee of seven to work out the details of this joint. This committee spent a year and a half in the work and at a meeting of the American Petroleum Institute, held in the Statler Hotel, St. Louis, Mo., in December, they presented their report, which was in detail, and I feel that I can do nothing better than to present their report in part, eliminating unnecessary detail matter.

This report included resolutions in which the manufacturers assembled adopted as a standard the I. & H. joint, and that the sizes be recorded as follows:

1⅝"x2⅝"	7 thd. flat U. S. form, pin length 3½"
2" x3"	7 thd. flat U. S. form, pin length 4"
2¼"x3¼"	7 thd. flat U. S. form, pin length 4"
2½"x3½"	7 thd. flat U. S. form, pin length 4¼"
2¾"x3¾"	7 thd. flat U. S. form, pin length 4½" and up to
4¼"x6"	7 thd. flat U. S. form, pin length 7"

Another resolution states that no change can be made in the diameters, length and taper of the I. & H. joint, but that the threads be changed to conform to the seven thread flat United States standard, which can be done with but very little trouble, having had templates made and tested with that thread. That the master templates be made of a suitable material for such purposes, and to be hardened and ground to size.

The point of vital interest to the consumer is the manner in which this standardized joint shall be guarded and controlled. From the following recommendations you will note that entire authority governing the joint is placed into the hands of the consumer's organization. The report recommends:

The adoption of a registered trade-mark for the standard cable drilling tool joint.

That: When a manufacturer is prepared and ready to order and use the standard cable drilling tool master template, he shall apply to the American Petroleum Institute for a certificate of authority to purchase and use such templates.

That: Upon receipt of an application for a certificate, a certificate shall be issued in duplicate for each size template, the duplicate to be sent with the order to the master template manufacturer, who is to be instructed that such will be his authority to furnish.

That: The original certificate to be kept by the manufacturer to whom issued as his authority to use the registered trade mark on cable drilling tool joints.

All cable drilling tool joint master templates to be consecutively numbered by the manufacturer, the numbers to be supplied on the certificate issued.

That: Each manufacturer adopt a uniform method of stamping joints using the larger dimension sizes of the taper, for example the 2¼x3¼—7 would be stamped:

3¼—7 A.P.I. Trade mark manufacturer's name.

That: Should a dispute between manufacturers and customers arise or among manufacturers as to the correctness of joints, such disputes may be sumbitted to the institute for a decision.

That: The American Petroleum Institute take steps immediately through advertising or some other manner or channels, to notify all interested in the purchase, use or manufacture of cable drill-

ing tool joints of the standard joints now adopted, urging co-operation and in ordering to insist on cable drilling tool joints carrying the registered trade-mark.

The report was unanimously adopted by the American Petroleum Institute as the standard for the oil and gas industry.

It was my intention to refer to the subject of standard outside dimensions of well-balanced tools for blast-hole drilling. I have decided, however, that this data should be presented to a committee on standardization of drilling tool joints and tools if this association decides to take up the subject.

I am certain you will agree that this joint standardization movement is of great importance, not only to the oil and gas industry, but to all who use cable drilling tools, which includes the active members of the National Crushed Stone Association. For that reason, I would recommend that it be referred to the resolutions committee to consider the appointment of a committee on standardization of cable tool joints and tools.

Remarks on Drilling

MR GRAVES: I would just like to say a word or two in this connection, in regard to the subject on which Mr. Gill has been talking. I do not know how clearly you may have gotten the thought that there is great range and extreme variation in sizes of all drill tools, and those of you who have more than one plant must realize, the difficulty in shifting tools from one place to another, and the burden on the manufacturer in making tools to fit all sizes.

I think it would be a mighty good thing if this association followed the suggestion made by Mr. Gill, that this matter be referred to the resolutions committee to consider the appointment of a committee on standardization, one phase of the work to be on the question of standardizing cable tools for drilling.

I think it is not a mistake to say at this time that Mr. Gill has had much experience in drilling, especially in the Panama Canal, and he is one of the few men in the country, today, who has had such broad experience as would amply qualify him as an expert on well drilling.

It is by a peculiarly fortunate circumstance that one of the other few men who is equally well qualified happens to be present, Mr. Reynard, of the Loomis Machine Co. I think it would be well worth our while to ask J. Reynard if he has anything that he would like to contribute to this discussion. (Applause)

J. Reynard's Discussion

MR. J. REYNARD: I do not know that I can add anything much to the paper just read. It covers the situation well on standardization of joints. Our company has been trying to get joints standardized, and we have a Standard I. & H. joint 2¼ in. x 3 ¼ in. here at present on exhibition. We understand quite well the trouble that the various joints cause the user. We often have parties send other makes and odd tools to our plant for a new joint, or they may want a bit to fit their joint. Many of them do not know who made the joint, nor what joint it is. This requires the manufacturer to keep a number of different templates in stock to try to fit somebody else's joint, or to fit some mongrel joint. Sometimes one of these templates will fit the joint very well, and then again it will not, and, as has been said, the oil industry has already taken up this question.

I think it would be an excellent thing for the National Crushed Stone Association to adopt one standard joint, 2¼ in. x 3¼ in, for 6 in. holes. I believe the oil people have already adopted the I. & H. joint of this size.

In speaking about bits and taper joints, it may be of interest for you to know the taper joints have been made over 200 years. The first taper joint was made in England. A word about drilling bits, for I must be brief. There was a drilling bit made something over 250 years ago that weighed eight tons. This was made in France, and the bit was a frame with a number of bits set in it. These were taken out and dressed. This was arranged to drill a 12-ft. hole for water purposes for Paris. A 5⅝ in. bit will weigh approximately 200 lb.

To give you any specific information as to bits, their handling and dressing, etc., is hard to do in a short space of time. I have had wide experience in different parts of the country as a driller of deep oil wells, gas wells, both in hard and soft rock. It may be of interest to you to know where the hardest rock I have found in the United States and Canada is located. It is a little streak about ¼ of a mile wide, just west of Poughkeepsie, N. Y. The other was at Whitney, N. C. Those two spots contained the hardest stone I ever saw. After we drilled a while near Poughkeepsie, I had dressed the well-drill bit 27 times to drill 12 ft. of hole, and after this hole was drilled and blasted the rock would break out in sharp points just like that (*here the writer showed by his fingers the shape of the rock*), and those portions or points of the rock which formed part of the wall of the drill hole, would look as though you had burned a log on it. It would not break up, but would leave these sharp points with the form of the hole shown theron. That was west of Poughkeepsie, N. Y.

The subjects of mining, vs. open pit quarrying, also lowering of quarry floors, were brought up this morning. I have had some experience along that line in different states. In some places they drill a series of holes and work down 75 or 100 holes. If you have water take a larger area, sink a hole right at the edge where you have broken up stone, and then put your pump down and pump the water out through this hole. I have seen this tried out in a number of places with success.

In drilling, there are so many different formations that it is hard for one to tell an audience like this what would benefit them most, especially so if they do not have the specific kind of rock and drilling you happen to be talking about. Take shale, limestone, granite, and different formations. Referring to the style of bits we have been talking about, I will add that the dressing of the bit, shape, form, and the weight of the tools, all go in to make a success of drilling. Some stone is all broken up in small pieces, some are granites, and do not break well, while others will break easy.

I have drilled holes in every kind of stone available, such as granite, sand stone, ganister, etc. Do you know what ganister is? In Canada we drilled a place where we would start an 8 in. hole and would drive or forge on the bit by steam hammer, some 4 or 5 in. of wearing surface, which would only run about 4 ft. By telescoping the hole we would start with an 8 in. bit and in a 35 ft. depth hole we would have to finish up 5 in. in diameter at the bottom.

I should like to speak longer, but the chairman has called my time.

MR. GRAVES: I would like to move you that this matter be referred to the resolutions committee to consider the appointment of a committee on standardization, in order that this matter may be voted on in the morning.

(Motion carried).

Report on Calcium Arsenate

THE possible supply of calcium arsenate for treating cotton fields to protect them against the boll weevil is thought to be equal to the probable demand in 1924, according to a report issued by a committee attended by representatives of the Bureau of Entomology of the United States Department of Agriculture and the Geological Survey. The consumption of calcium arsenate in 1923 was about 31,000,000 lb., practically double the consumption of 1922. Under reasonably favorable conditions, the demand for 1924 may again double.

General imports of white arsenic for the first 10 months of 1923 were at the rate of about 10,000 short tons a year. If this rate continues until July 1, 1924, imports available for the "cotton year," added to the domestic production, give a total possible supply of 28,000 tons of white arsenic.

"Hercoblasting"

By J. Barab
Hercules Powder Co., Wilmington, Del.

IN an article in the April, 1923, issue of *The Explosives Engineer*, Mr. T. W. Bacchus described a new blasting method, called Hercoblasting, which it was then believed would effect large reductions in the cost of explosives on operations to which it is applicable.

Mr. Bacchus' article explains the method in detail, and as it is readily available to anyone who is interested, it seems unnecessary to cover that ground again. When it was written, only a limited number of field trials had been made, but since then Hercoblasting has been tried in various kinds of open-pit operations, and has been adopted by a number of them. Reports from every trial have been highly satisfactory. This paper will summarize for you the experience of a number of explosives users who have profitably employed Hercoblasting on various kinds of work, and will only touch on points in connection with the practice of the method which demand special consideration.

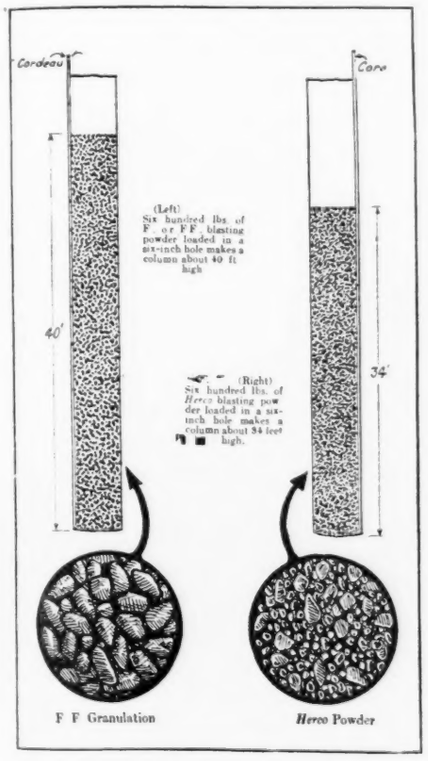


Diagram 1—Black powder and "Herco" charge compared

In Hercoblasting, black blasting powder is used with Cordeau-Bickford detonating fuse in column loads. Due to its slowness, black powder cannot be used satisfactorily in column loading without detonating fuse; but Cordeau-Bickford imparts to it a longitudinal velocity of approximately 17,000 ft. per second; and speeded up in this way, black powder gives results on certain work, equal in every way to those produced by high explosives. From the following Table 1, which indicates the quantities of black powder required to replace 100 lb. of various grades of high explosives, and compares the cost, the saving effected by Hercoblasting can be clearly seen.

As Cordeau-Bickford is used to a large extent with high explosives, many operators can use this table for a direct cost comparison between black powder and dynamite; but where Cordeau-Bickford is not ordinarily used, its cost, less the cost of the electric blasting caps which it replaces, should be added to the costs shown in the table for Hercoblasting.

Black powder cannot be used satisfactorily in holes that contain a large amount of water, or when water is continually flowing into the holes. In such cases we do not recommend its use. But where there is only a small quantity of water in the bottom of the hole, Hercoblasting is successful if the hole is loaded with high explosives to a point above the water level, and with black powder for the rest of the distance.

Although any of the smaller granulations of black blasting powder may be used, a special granulation known as "Herco" granulation is the most satisfactory for this purpose. Hercoblasting powder is composed of various sized granulations. In a charge of uniform granulation black powder there is always a large amount of air possible to load more powder by weight in a given volume of space. The difference in the apparent density between a charge of Hercoblasting powder and a charge of ordinary black blasting powder is indicated in Diagram No. 1.

Ordinarily we do not speak of black powder as having a definite strength in the same sense that dynamite has. However, we have found that a great deal of work requiring high explosives of from 30 to 40% bulk strength can be successfully accomplished with Hercoblasting powder. Table No. 2 shows typical results obtained throughout the country in open pit operations of many kinds.

Table 1 indicates that a saving of from 28.4 to 45.6% may be expected by displacing high explosives with black blasting powder; but this table is based on a direct and complete substitution, which is not always possible.

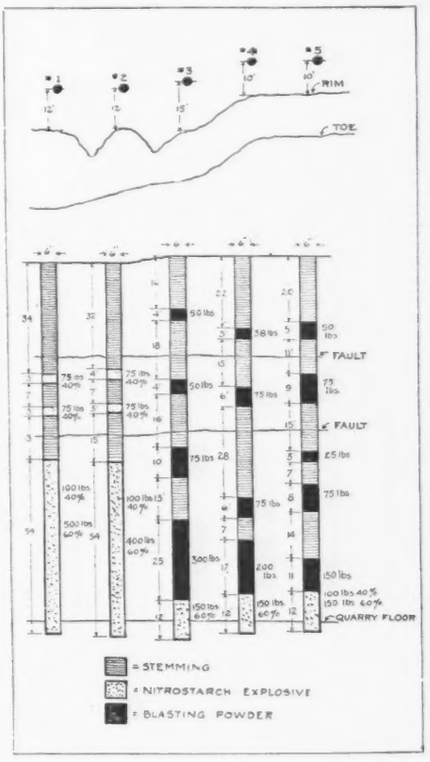


Diagram 2—Method of loading blast holes in limestone quarry

TABLE I

Using High Explosives		Hercoblasting Method			
Brand	Cost per 100 lb. C/L price in Pennsylvania	Lb. Hercoblasting powder required to replace 100 lb. high explosives	Cost per 100 lb. Hercoblasting powder in 800 keg lots, Pennsylvania	Cost of Hercoblasting blasting powder necessary to replace 100 lb. of high explosives	Per cent saving by replacing high explosive by Hercoblasting
30% L. F. Extra	$12.50	100 lbs.	$6.80	$6.80	45.6%
40% L. F. Extra	13.25	125	6.80	8.50	35.8
Special No. 1	14.25	150	6.80	10.20	28.4
Special No. 2	13.25	125 to 150	6.80	8.50 to 10.20	28.4 to 35.8

Table 2 shows savings that have been made on different operations. The actual saving will, of course, depend on the extent to which Hercoblasting powder is substituted for high explosives.

Diagram No. 2, above, illustrates the method of loading a blast in a Tennessee limestone quarry where by proper distribution of explosives the rock was broken into a very convenient handling size.

Diagram No. 3, page 94, is another illustration of proper distribution of explosives for breaking the rock into a practical size. This represents the method employed at a Pennsylvania cement quarry.

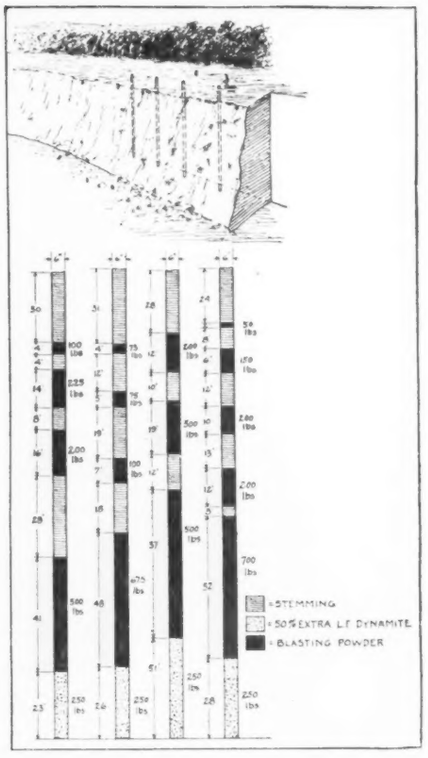


Diagram 3—Proper distribution of explosives in blast holes

over a strictly localized area. Hercoblasting is recommended only in well drill holes, and these are usually spaced at least 15 ft. apart and often as much as 25 or 30 ft. apart, with a burden somewhat greater than their spacing. On such work the type of explosives used has very little effect on the degree of fineness to which the major portion of the rock is broken. In open-pit operations it is only necessary to use an explosive strong enough to throw down the material and to have the explosive properly distributed. The distribution is probably the most important factor in breaking the rock to the required size. An explosive of greater strength or velocity than is actually needed to break down the material will not appreciably increase the amount of rock of a convenient size, though it will pulverize more of it adjacent to the charge. Experience has shown that in many cases Hercoblasting powder shot with Cordeau-Bickford is strong enough and quick enough to break the rock, and where this is so, the ideal method is closely approached in Hercoblasting. In all the blasts of which we have record, the rock has been exceptionally well broken, and in limestone the advantage over high explosives is increased because here the fines are often a waste product.

TABLE II—TYPICAL RESULTS WITH HERCOBLASTING

Type of Work	Explosives ordinarily used	Method of replacement	Actual saving in per cent of explos. cost
An Anthracite Stripping Operation	Black powder in sprung holes	Regular Hercoblasting	21%
An Anthracite Stripping Operation	Special No. 1	Some high explosives in bottom of hole. 1½ lb. black powder displacing 1 lb. Special No. 1.	20
An Anthracite Stripping Operation	Special No. 1	Some high explosives in bottom of hole and less than 1½ lb. black powder displacing 1 lb. Special No. 1.	29.5
An Anthracite Stripping Operation	Special No. 1	Special No. 1 in bottom and 1½ lb. black powder displacing 1 lb. Special No. 1 for remainder.	19
An Anthracite Stripping Operation	Special No. 1	Special No. 1 in bottom and less than 1½ lb. black powder displacing 1 lb. Special No. 1 for remainder.	31
A Missouri Cement Quarry	Special No. 1	1½ lb. black powder displacing 1 lb. Special No. 1.	23.8
A Texas Cement Quarry	Various grades from 30 to 60%	Black powder loaded pound for pound against high explosives.	31
A Pennsylvania Cement Quarry	30 & 50% Extra	Some 50% extra in bottom and remainder black powder loaded pound for pound against 30% Extra L. F.	42
A Wisconsin Lime and Cement Quarry	40% Gelatin	125 lb. black powder displacing 100 lb. 40% gelatin.	30
A Tennessee Cement Quarry	40% Nitrostarch	Black powder loaded pound for pound against 40% nitrostarch powder.	35
A Tennessee Limestone Quarry	40 & 60% Nitrostarch	On account of holes being wet on bottom 150 to 200 lb. high explosives were in bottom of hole—but for the remainder black powder was used pound for pound against nitrostarch powder.	39
An Ohio Limestone Quarry	Special No. 1	Less than 1½ lb. black powder displacing 1 lb. Special No. 1.	33
A Michigan Limestone Quarry	Special No. 1	Less than 1½ lb. black powder used in place of 1 lb. Special No. 1.	33
A Pennsylvania Flux Limestone Quarry	40% Extra L. F.	1¼ lb. black powder displacing 1 lb. 40% Extra L. F.	33
A Michigan Limestone Quarry	40% Extra	1¼ lb. black powder displacing 1 lb. 40% Extra.	33
A Tennessee Stone Quarry	40% Nitrostarch	50 lb. nitrostarch in bottom and for remainder 1 lb. black powder displacing 1 lb. nitrostarch explosive.	41

The great difference in velocity of explosion between black powder and even moderately strong high explosives makes it difficult for many to believe that the former can do the work of the latter. Those who are troubled with doubts on this score should remember that even the strongest high explosives exert their shattering effect

A word of caution is necessary, because of the inflammability of black powder. Due consideration should be given to this, and all necessary precautions should be taken wherever there is danger from flying sparks or flame from steam shovels, locomotives and other sources.

We have every reason to feel gratified at the success attained by Hercoblasting. Practically every trial has created an enthusiastic partisan for it. We are anxious to maintain this record, and we know that we can do so unless the method is employed unadvisedly under conditions for which it is not adapted. To guard against this, we advise any of you who are considering Hercoblasting to study the matter carefully before going ahead. If the company which I represent can be of any assistance to you in determining whether or not Hercoblasting is suitable to the conditions you have to meet, we are at your service. If it is, you may be sure that it will give you equal breakage at lower cost.

Gypsum Land Plaster for Poultry Yards

AN agricultural use for gypsum land plaster that West Coast producers are evidently developing is for poultry yards. The Petaluma, Calif., *Poultry Journal* of August 1 prints the following:

While lime has long been used on the dropping boards of poultry houses, it should be superseded by gypsum, or land plaster, as it is sometimes called, if the best results are desired from the droppings as fertilizer. Lime is caustic and not only burns the hands of the handler, but also the feet and breathing apparatus of the fowls, irritating the membrane and making them susceptible to diseases of the respiratory organs. When the fowls fly to or from the perches, they stir up a certain amount of the lime, filling the air with its caustic dust and endangering fowls and caretaker.

Gypsum is pleasant to handle, does not irritate the nasal passages, nor burn the feet of the fowls. Its value as a preservative of ammonia around stables and poultry houses has been recognized and taught in the schools of older countries like England and Germany for many years.

Gypsum fixes and preserves the ammonia which would otherwise escape into the atmosphere in the form of gas. Gypsum stops the odor, while lime in any form makes the odor stronger and burns up the plant food.

Gypsum should be sprinkled freely on the floors and droppings-boards, in the liter, dust-baths and on the manure pits. It also absorbs moisture better than lime. The sulphur trioxide of gypsum is a much better disinfectant than the carbon dioxide of lime, because germs that will thrive in carbon dioxide are completely destroyed in sulphur trioxide.

Gypsum preserves the fertilizing qualities of the droppings, whereas lime injures them.

Contract for Missouri Highway Stone

B. H. Piepmeier, chief engineer of the Missouri State Highway Commission, has announced that he has closed a contract for the commission with the Joplin Crushed Flint Co., Joplin, Mo., for an unlimited supply of crushed stone, with a minimum of 50,000 tons a year in the Kansas City territory, at a price of $1.10 per ton. The quarry is near Kansas City and was discovered by the state highway department, Piepmeier said. It will reduce road-building prices in that vicinity, he added, and will effect a great saving to the road system.

Blasting Data—Costs and Efficiency

By S. R. Russell
Technical Representative, E. I. du Pont de Nemours, Wilmington, Del.

THE subject of this paper is a rather comprehensive one. I was not aware until I received a program of this meeting a few days ago that I was to take part in it and I regret therefore that I have not had time to cover with any degree of fullness the subject assigned to me. A few thoughts on blasting, even if seemingly not associated with the title, may not be amiss.

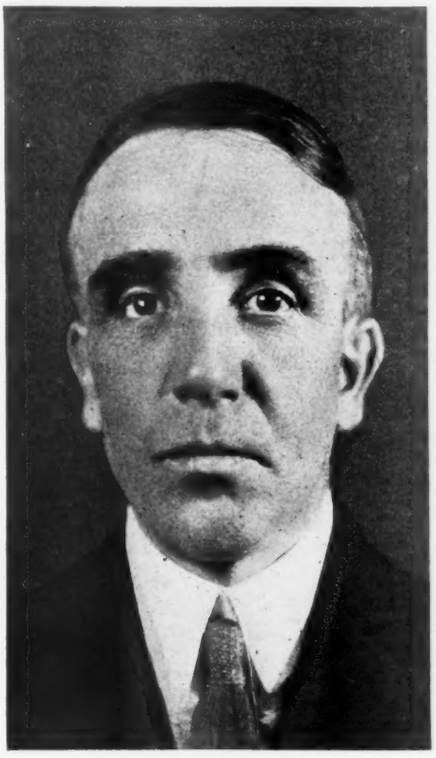
The very word "data" immediately suggests the word "costs" and I have no doubt that cost figures are interesting and instructive, although perhaps also very dry. I'm not going to attempt a long or detailed discussion of them. They vary so much in actual practice, and it is an extremely difficult matter to get full detailed and reliable records. It is a simple matter, as a rule, to arrive at the initial or primary blasting cost of any particular blast; but it is another matter entirely to get full details of this item after the shot has been cleaned up. I know of some operations where quite complete systems are used for arriving at these costs, but taken as a whole quarry operators do not, I find, keep blasting costs in detail. Of course it is easy at the end of the season to weigh the production against the explosives used during that season and say that represents the cost of blasting. It does to a certain extent. It is better, however, I think, to know the cost of each individual shot, taking into consideration the natural conditions surrounding it. The depths, spacing and condition of holes, height of face, amount, kind and strengths of explosives used in each shot should be known. In addition to this the amount of secondary drilling and blasting done before that shot is cleaned up, the shovel delays while cleaning it up, what caused these delays and the time lost and the distribution of the cost of those delays all down the line through the crusher.

In this way it is possible to determine properly the efficiency and economy of certain hole spacings or kinds of dynamite. Every quarry must be studied by itself. Oftentimes it requires considerable experimenting to determine the proper spacing of holes and the right grade of explosives to use in order to arrive at most economical costs. The blasting is of prime importance in any quarry and it affects every subsequent operation entering as it does at the very conception of the job.

Because certain methods of drilling or a certain type of explosives is used with success in one operation is no assurance that the same methods and types will suit in another quarry even though apparently similar.

I find that primary blasting costs differ widely in quarries producing practically the same character of stone. I know of one operation, a very large one—where the cost in 1923 averaged over six tons per pound of explosives used and 80% of the total consumption was 40% strength. This includes primary and secondary blasting and is based on an output of over 6,000,000 tons.

I know of another where the cost was approximately three tons of stone per pound of explosive and about 50% of the consumption was 60% dynamite and the other half 40%. Yet both quarries produce stone of very similar nature and it is used for identical purposes.



S. R. Russell

Both operations are large ones; they are equipped with large crushers, shovels, etc. In the first case the natural conditions are exceptionally favorable, the stone breaks up well and scarcely any secondary blasting is required. Wider spacing of holes is possible, which means greater tonnage per drill foot and greater tonnage per pound of explosive. In the second case the stone tends to come out in larger, heavier masses, necessitating considerable secondary drilling and blasting. In the first case a railroad type shovel—4-yd. dipper—loads approximately 2700 tons per shift, while in the second case a shovel of the same size loading 1500 to 1800 tons per shift has made a good run. Lower strength explosives at lower cost are used in the first case than in the second. This may illustrate how widely blasting costs can vary and it will be obvious to all of you that the shovel costs and all other costs down the line do likewise.

As a general average I consider four tons of stone per pound of explosive for primary blasting very good, if the rock is broken up well enough to keep the secondary cost at a minimum and consistent with the equipment for loading and crushing. Possibly three tons would be nearer the average met with in most quarries. Anything over five is exceptionally good, as in the quarry mentioned above where the explosives used for secondary blasting is less than 1% of the total consumed, yet the recovery is better than six tons to the pound.

Still I believe it better policy to increase the initial cost of the blast, either by spacing holes closer or using more or higher grade dynamite, if the secondary costs of drilling and blasting can be reduced. I know of some quarries where the secondary blasting cost is practically equal to the primary cost. This should not be. A better condition exists where the rock is broken so that the secondary blasting cost will not exceed from 25 to 30% of the primary cost. It is not only the cost of the secondary drilling and blasting that counts, but it is the delays which this causes to the operation of the shovels that is the big item. Anything which cuts down the efficiency of the shovel should be avoided.

The secret of economical operation in any kind of rock excavation is removing the greatest volume of muck or rock in the least time. This applies whether it is driving a tunnel, deepening a harbor, mining coal or ore or quarrying rock. There is nothing which has a greater bearing on this factor than the blasting—blasting here is taken in its broad meaning to include drilling.

There are basic factors in blasting procedure and basic truths about explosives which greatly affect the cost of producing stone. The power of any explosive to perform work depends upon two facts; first, that a very small volume of the solid explosive forms a very large volume of gas, and second, that this change from a small to a large volume takes place in an exceedingly short interval of time. Explosives differ in the volume of gas formed when detonation takes place and in the time required for the change from the solid to

the wholly gaseous state, and the temperature of the explosion. All of these factors —volume, time and temperature—affect the power of the explosive. The greater the volume and higher the temperature and shorter the time, the quicker, stronger and more powerful is the explosive. Therefore in selecting an explosive for a quarry producing crushed stone where the material is hard, better results will be obtained by using a strong, quick, highly shattering explosive of say gelatin type than with a slower one.

One explosive may evolve just as large a volume of gas when detonated as another, but at a lower temperature and require more time; if so it will not strike the containing walls as hard and sharp a blow as one which reaches the wholly gaseous state in less time with a higher temperature of combustion.

Some experienced quarrymen think that it is always more economical in the long run to use a high strength explosive in the primary shot. There is a lot of good sense in this belief, too, especially in quarries where the harder rocks, such as trap, granites and hard limestones are produced. In most quarries of this kind more trouble is caused by failure to get good initial fragmentation than otherwise. In some hard rock operations the cost per foot of drilling is extremely high. I know of some where 4 to 5 ft. per day is the average for a well drill. In a case like this it pays to use a high strength explosive because often it is possible to set the holes at a wider spacing, thus reducing the drilling cost per ton of rock and compensating therefor by using a high strength dynamite. In softer materials often the reverse is true, viz., that the drilling cost is low proportionately. In a case like this it may be more economical to use closer hole spacings and a lower strength dynamite. Each quarryman should find the proper balance between the drilling cost and actual explosive cost. This applies whether well drills or tripod drills are used.

In any event the important thing in blasting is to break up the ground so that it can be handled easily and in the greatest volume by the shovels. If the digging is made easy, it means less wear and tear on the equipment, lower cost of upkeep and repairs, a greater output through the crusher and a lower final cost per ton.

The ground must be properly prepared for the blasting; that is, the holes must be drilled to proper depth and spaced with judgment in order to get the best results from the explosives used in them. I find in some quarries that often too much is expected of the explosive and not sufficient attention is given to spotting the holes. I have seen holes set so far apart and so far back that no explosive, no matter how strong, could possibly give satisfactory results.

Not long ago I heard a quarry superintendent say of a drill runner, "That man is one of the speediest runners I ever saw, but he is very poor in spotting holes." This was a quarry using tripod drills, and the point was brought out that the results from blasting were not so good as when holes were drilled by another man who used judgment in spotting the drill holes. It doesn't cost any more in the final analysis, but rather it often means money saved to see that the holes are drilled correctly. If closer attention is given to the drilling, better results will be obtained than if sole dependence is put on the explosive. The degree of fragmentation of the rock depends greatly on the distance apart between the holes. In well drill work, or for that matter even in tripod drilling, the mistake is often made of setting holes too far apart. I believe it is better to err in setting them a few feet farther back. Too much stress cannot be given to the importance of drilling in quarry operations. If this is done properly, one has gone more than half way in arriving at a reasonable blasting cost.

Too much attention, I fear, is often given to the first cost of the explosive, forgetting the after costs. What the quarry operator is interested in is putting the stone on the cars at the lowest possible cost. I believe that this can often be obtained by closer attention right at the beginning of the work, which is the drilling and blasting. It isn't the first cost so much, but the final total cost that counts.

News of the Industries

New York State Crushed Stone Plant Doubles Its Capacity

WITH the increased demand for limestone and its by-products for use along agricultural lines and road building as well as in paper making, chemical manufacture and other lines of endeavor, the Jointa Lime Co. has found it necessary to increase its output and accordingly has purchased a new No. 6 crusher which will approximately double the concern's capacity.

The Jointa Lime Co., at the annual meeting recently, elected the following directors J. I. Fowler, T. Coolidge Fowler, George F. Cook, Hollis Stewart, H. J. Russell and R M. L. Carson. Officers—President, J. I. Fowler; vice-president, R. M. L. Carson; secretary, Hollis Stewart; treasurer, H. J. Russell.—*Glens Falls, N. Y., Post-Star.*

Receiver for Virginia Carolina Chemical Company

ACCORDING to a dispatch sent by the International News Service to many newspapers: The Virginia-Carolina Chemical Co. failed March 3.

The federal court for the district of New Jersey appointed C. M. Wilson, president of the company, and Arthur V. Vanderbilt as receivers.

The company manufactures acids, chemicals, and fertilizers. It has 12 manufacturing plants in Virginia, South Carolina, North Carolina, Maryland, Georgia, Florida, Alabama, Louisiana, Tennessee, Ohio, Indiana, and New York.

The capitalization consists of 279,844 of common no-par stock shares; 69,961 shares of common "B" no par stock, and $21,565,-563 of preferred cumulative 8% stock, par value $100. Its total outstanding bonded debt is $37,375,000.

President Wilson issued a statement saying that the receivership was determined upon in order to protect the interest shareholders and permit a satisfactory readjustment.

The Virginia-Carolina Chemical Co. is not only a great manufacturer of fertilizers but a heavy producer of phosphate rock with plants in Tennessee and Florida.

Begin Construction of Santa Fe's Rock Crusher at Brownwood, Tex.

ACTUAL work toward the installation of the Santa Fe's rock crusher enterprise on Hall mountain (near Brownwood, Tex.) is begun and a big crew of men will start grading for the railroad track to connect the industry with the Santa Fe tracks. The track will be approximately two miles in length and will be laid on a 3% grade.

The grading work for this railroad track is expected to be completed within 35 working days.—*Brownwood, Tex., Bulletin.*

California Builders Protest Increase in Cement Tariff

THE bill now pending before Congress to increase the tax on foreign made cement imported into this country is sponsored by the "cement trust," according to a resolution of protest adopted recently by the Building Trades Council of Alameda county, California. Topics of the resolution have been forwarded to President Coolidge and to Congress.

The resolution pointed out that European cement manufacturers can send their product half way around the world and sell it in Oakland for less than local manufacturers. The Building Trades Council charges that the cement manufacturers throughout the country have organized to gouge the public.—*Oakland, Calif., Post-Enquirer.*

[According to excellent authority cement sells in the United States for less than it sells on the continent of Europe. What cement is sent here is surplus that is "dumped" on the American market at (probably) less than the cost of production.—Ed.]

Crawler Trucks Applied to Quarry Shovels

By Harvey T. Gracely
Marion Steam Shovel Co., Marion, Ohio

IN so far as digging and loading equipment is concerned, I believe I am safe in saying that the subject of crawler trucks as applied to railroad type shovels offers as much interest as any other one subject about excavating equipment.

A year ago, at the Chicago convention, you will remember this feature was announced as "The greatest improvement that has taken place in railroad type shovels during the past 20 years." That takes us back to the time when we abandoned friction-type shovels and got into the throttle-operated machines. The basis of this statement was made on the fact that manufacturers believed certain economies could be effected that would be of vital interest to the quarry operators. It was announced at the time that 20% to 30% additional output could be obtained from a shovel equipped with crawlers and that the operating cost could be reduced 20% to 25%. These figures have all been verified by actual performance—in fact, they have been exceeded.

I take it that it will not be necessary today to present the design of these crawler trucks to you, but assuming that possibly some of you might not quite understand their construction, I will just take a moment to give you a brief outline. Essentially, there are three crawler units, two located at the front of the machine and one at the rear. Those at the front are spaced approximately 20 or 22 ft. apart, and their location and construction is such that the compression strains down the A-frame are transmitted to the trucks through trunion castings direct from the shovel structure. The compression strains that come down the boom are transmitted through sill and bolster castings over to these trucks. The front trucks are propelled either independently or together. The steering trucks are located at the rear of the machine, operated from a steam engine. No tracks, rails, jack blocks or jacks are required, and the operating crew can be very materially reduced.

I have written to some quarry operators in different sections of the country, asking them for their experiences, and I have a few letters here which I am going to read you just as they came to me, believing they will give you the information you are seeking at this meeting.

The first letter is from a quarry operator in the Youngstown district, in eastern Ohio. It is in response to an inquiry asking for certain facts, experiences, etc.

Typical new Marion Model 70 quarry shovel equipped with crawler treads

This particular operator says: "Twenty-one hundred tons in nine hours as against fifteen hundred tons with the track trucks." I'll give you his entire letter:

Our new Model 76 Marion with its crawler trucks has been on the job a little over a month. It has been working a face of stone less than 5-ft. thick and repeatedly has loaded over 2100 tons of stone in a 9-hr. day. This tonnage made it necessary to move the shovel ahead 120 ft. or more than 20 moves of standard railway type of shovel. For years previous to the coming of this shovel, we have worked this same 5-ft. face of stone with railway type Model 76 shovel and 1500 tons per 10-hr. day is the highest our records show, and in order to get the 1500 tons, it was

necessary (due to labor's attitude) to have six pit men and a coal man.

This shovel is operating at the rate of 2000 tons or more per 9 hr. and the pit and coal crew consist of two men. Our expericence is that the shovel is always in position to dig; 30 sec. being all that is required to move up, as against a fair average of 6 min. with railway type of shovel.

We have operated our shovel on three short cuts, all of them on a rather sharp curve. We learned after the first cut that the clutches on main sprocket shaft were put there to be used. We uncoupled the clutch on the short or introdus side of curve and dug and propelled shovel on curve with only one side of crawlers doing the pulling the same being true backing up.

We have made only one move back, it being 2900 ft. long. The shovel covering the distance with no additional men in just 35 min. We are more than satisfied—we are in fact surprised. This makes the tenth Marion shovel at this quarry, all working except one—old Model G, about 30 years old.

How soon can you ship us two more sets of crawlers for Model 76 shovels?

Here is another from the Michigan district. This firm has had considerable experience with crawler trucks:

We have been able to increase the output of the shovel in tons or yardage better than 5% on average. The big item with us so far has been the saving in crew labor. For operating our truck shovels we use a crew of seven men, including four pitmen; the crew of the caterpillar mounted shovel consists of five men, including only two pitmen. This entails a saving to us per 10-hr shift at the rate of pay of these two pitmen, plus certain additions, of a total of $11.80. One of the great advantages of the caterpillar mounted shovel is its flexibility during movements in the quarry. We have found that we have been able to move the caterpillar shovel back the length of the working face in approximately one-third of the time usually required for the shovel mounted on trucks. Our experience with a truck shovel remounted on caterpillars has been so satisfactory that we are equipping our remaining five steam shovels, now in use, with caterpillar mountings for the 1924 season. With this equipment, we expect to get an increase of better than 10% in output per shovel.

Here is an experience from northwestern Ohio. This is from a personal interview with the man in charge of operations in a slag pit. He told me "That no pit men whatever were required, but formerly required four men at 48 cents an hour, thereby saving approximately $17 a day (8-hour day). With crawlers, moving up is accomplished in about ten seconds, as against fifteen minutes previously, a saving of 95% plus."

I believe that I am safe in leaving with you the thought that these crawlers can be paid for by the savings effected in one season's operations. Surely it ought to be accomplished in less than two seasons.

I should say, in reference to a conversation I had with Mr. Wilson, of California, that there are certain types of the smaller railway type shovels that can probably be operated on traction wheels just as efficiently as on crawler trucks, but since my subject dealt with crawler trucks, I believe that I can leave with you the assurance that on the larger shovels you will be safe in not only using crawlers on new equipment purchased during the coming years, but also installing them on the older shovels now in use. From now on it will be possible to purchase crawlers for all sizes of railroad type shovels, with the possible exception of the very smallest.

I dare say, in closing, that no other equipment will pay for itself in such a short time as the application of crawler trucks to any kind of railroad type shovels.

Crawler-tread shovel in action opening new quarry

Bureau of Census Asks for Manufacturing Statistics

THE Bureau of the Census is now engaged in collecting statistics of manufactures covering the calendar year 1923. These statistics are compiled in accordance with the Act of Congress of March 3, 1919, and the schedules have been prepared after conference with the associations and others interested in the various industries. The schedules were mailed to the manufacturers on January 2 and the Director of the Census is very anxious to publish the statistics at the earliest possible date in order that they may be of the greatest possible commercial value. The manufacturers engaged in our industry are urgently requested to forward their reports to the bureau at the earliest possible date, preferably before the end of January. The bureau has agreed to tabulate the results for our industry as rapidly as the schedules are received and publish the totals within a few days after the receipt of the last report.

The bureau has been co-operating very closely with the industry and desires to be of service to us; we should in turn show our appreciation by complying with the request of the director to mail our reports promptly.

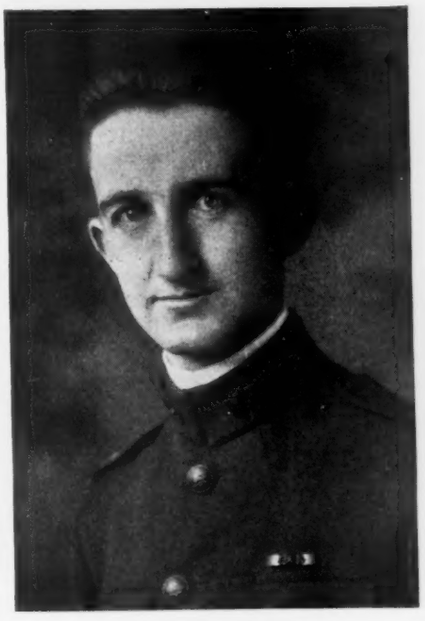
Developments in Secondary Crushing

By C. S. Darling
Sales Engineer, Pennsylvania Crusher Co., Chicago, Ill.

THE single-roll type of crusher is used very successfully under the conditions for which it is designed to operate, both as a primary and secondary crusher. A consideration of rolls, both single and double, as primary breakers was presented before the convention at Chicago a year ago by my friend, Mr. McGrew. Mr. McGrew's paper, which probably most of you heard, and which appears in the Quarry Manual number of ROCK PRODUCTS for last year, carefully and thoroughly explains the single roll when used as a primary crusher with steam shovel feed, and I am not going to spend any time upon that point. My subject confines me to secondary crushers, but I am going to say a little about the smaller sizes of single rolls when used as primary crushers on hand-loaded or one-man stone in the smaller stone and lime plants, and when used on burned lump lime, gypsum rock and similar materials.

It is probably best to define clearly in the beginning the field in which the single roll will operate, for like all other crushers and most other pieces of mechanical equipment, it has limitations and there is a more or less definite field in which this type of crusher operates most satisfactorily—in most cases where the conditions are suitable this crusher operates more satisfactorily than any other type. It is of no use to consider the crushing of trap rock, granite or exceedingly hard limestone on the single roll. Moderately hard limestone can be successfully crushed, and the softer limestones, gypsum rock and materials of that nature are crushed in the single-roll crusher with better results in most cases than with any other type. It is a well-known fact that the single-roll crusher makes fewer fines than other types, and it is therefore desirable in the making of road material and similar products where the stone is adapted to such crushing, and where fines are a waste product. This, then, fairly well defines the field of the single-roll crusher—on stones which are not too hard and where a uniform product with a minimum of fines is desirable.

One of the outstanding advantages of the single-roll type of crusher is its natural self-feeding action. You can dump as much material as you wish into the hopper on top of the roll and very seldom will you be troubled with blockades in the crusher as so frequently happens in other types. The action of this roll, operating at a speed of from 25 to 60 r.p.m., with its knobs or teeth stirring up the product on top of the roll and between the roll and the curved breaker plate, means that the material is constantly agitated and does not get a chance to bridge or form blockades. This advantage is particularly apparent where the feed is wet or frozen or contains mud, clay, or other slippery material. In crushers where the crushing action depends upon the straight pinching action or direct pressure, such slippery material will slide up and down in the crusher and greatly reduce the output. This is a familiar occurence with most quarry operators where the material is not constantly and uniformly dry and clean. The teeth of the roll stirring the material up and drawing it into the zone of crushing, carry out this operation regardless of the



C. S. Darling

slipperiness of the material on which it may be operating. It is true of course that material with a large percentage of wet mud or clay forms a very difficult condition and will slightly reduce the capacity of the machine, but this reduction in capacity is only a small percentage whereas in other types of machines the reduction may be so serious as to amount to 75% or even to almost wholly stop the output of the crushed material.

Because there is no obstruction to the passage of material in the zone of crushing, and because for corresponding size of feed, the hopper opening is much greater than in other crusher types, a single-roll of equivalent weight, and horsepower requirements will handle larger stone or reduce it at a greater rate of crushing than other types of crushers.

It is often unnecessary to maintain an attendant at a single-roll crusher because of its self-feeding and non-blocking action, whereas with a gyratory or jaw crusher it is essential to have one or more men constantly at the crusher hopper to push material into the crushing zone and to break up blockades that form in the feed. I have seen as many as four or five men around a No. 6 gyratory crusher pushing stone in, in order that the crusher might give the maximum possible capacity, wheras a single-roll type would have handled all this tone at its maximum rate without more than occasional attention from a single operator.

The single-roll for handling one-man stone will ordinarily be provided with alternate rows of low and high teeth, the higher ones being from 1½ in. to 3 in. high. These teeth provide the agitating and feeding action already referred to, and they also have a slugging action on larger pieces of rock which may be too large to come into the throat of the machine. This slugging action quickly reduces such large pieces until they are of such size as to get into the throat of the machine and be quickly crushed between the roll and the breaker plate. With exceedingly hard varieties of rock such as trap and granite, this slugging action is not effective and for that reason limits the usefulness of this machine to stones equivalent to moderately hard limestone in hardness. If, after engineers have examined your stone, you are told that its successful crushing by the single-roll method is doubtful; do not be disappointed. If, however, your stone is not unusually hard it will pay to investigate the possibilities of this type, for it unquestionably has advantages where it can be used.

This type of crusher in sizes similar to those used for primary breaking on one-man stone may also be used for secondary crushing following large primary breakers, operating on steam shovel feed.

When finer crushing is desired on a single-roll, the roll is usually furnished with a smooth curved breaker plate instead of the corrugated plate used for coarser crushing, and the roll then is provided with longtitudinal flutes running the entire length of the roll instead of with teeth as already indicated. I have in mind an operation in Pennsylvania where the product of a No. 7½ gyratory crusher, running to 4 or 5 in. in size, is fed to a fluted single-roll with flutes ½ in. high. This roll is set with ⅛-in. clearance from the breaker plate, and this gives a product about ⅝ in. to ¾ in., with a minimum of fine material. This is a product which is in considerable demand for road work in the vicinity of this crush-

ing plant. I have never seen an operator at the single-roll crusher, while there is always one or two men at the primary crusher above. The uniformity of the product and the absence of fine material is the remarkable thing about this operation. I have here some of the stone from this plant, and you will see that it is fairly hard limestone and good road material. I should say that this stone approaches the limit in hardness of stone that can be satisfactorily handled on a single-roll crusher.

To give you an idea of the size and weights of such a machine, the crusher which produced this product has a roll 18 in. in diameter and 36 in. long, it weighs about 15,000 lb. and it will produce this ¾-in. product on the moderately hard limestone at 20 to 25 tons an hr. If this same crusher were crushing one-man stone down to about 2 in. it would have a capacity of 30 to 45 tons an hr.

The 18-in. diameter roll is the smallest made for this sort of crushing, and the roll lengths vary from 16 in. to 36 in. The crusher with 18-in. diameter roll 16 in. long weighs only 5000 lb. and will crush one-man stone down to 2 in. at the rate of 10 to 15 tons an hr. Such a crusher would require from 10 to 15 hp. to operate.

A somewhat larger roll, with 21-in. diameter roll and heavier frame construction will crush up to 100 tons an hr. down to a product practically all of which will pass a 4-in. ring and probably 60% to 75% of which will pass 2½-in. ring. On softer material such as gypsum rock this 21-in. roll 42 in. long will have a considerably larger capacity. It would be possible to crush as much as 150 tons hourly of mine run gypsum rock down to 2½ in. to 3 in. on a 21x42-in. single-roll crusher.

Single-roll crushers are made with rolls 24 in., 30 in., 36 in. and 48 in. in diameter. The 48-in. diameter roll is rarely used, since its capacity is enormous and the 36-in. diameter of roll is sufficient to handle average quarry-run rock when loading with a steam shovel. A common size of single-roll crusher for primary rock crushing is the 36x30-in., where the roll has a diameter of 36 in. and length of 60 in. A crusher of this sort will have a capacity of several hundred tons an hour on steam shovel feed crushing down to 6 to 8 in. The 24-in. diameter roll is an intermediate machine between the 21 and the 36-in., and with its heavier frame construction, it is capable of handling larger feed than the 21-in. roll.

The important development which I want to emphasize here is the steel frame construction of the single-roll crusher. Hammer crushers with unbreakable steel frames have been known for the past 15 years and have been the choice where most dependable operation has been a consideration. During the past three or four years the single-roll crusher, which has always been made with the cast-iron frames up to that time, has undergone a change in frame design so that the most modern of the single-roll crushers are now built of steel, usually of structural steel, though sometimes with cast steel side pieces and structural steel top, bottom and end pieces. This is a step toward greater dependability because when properly designed a steel frame is practically unbreakable, whereas with a cast iron frame, in spite of the protective features, there is always some danger of frame breakage.

Steel-frame, single-roll crushers were first designed to crush coal particularly for stoker feed preparation in power plant and steel works and preliminary to the pulverizing of coal for use in pulverized fuel burning plants. Except for the Bradford Breaker, which is used on Central Station and other larger work, where the coal capacities are 75 to 100 tons an hour or greater, the single-roll is the most effective type of crusher for the preparation of stoker feed, because there is less oversize and a smaller percentage of fines in the product when crushing with the single-roll than when using other types.

The steel-frame, single-roll for stone-crushing is identical in principle with the steel-frame, single-roll for the crushing of stone and other materials. The difference lies in the heavier frame construction when the machine is designed for stone crushing.

New Type of Swing-Hammer Crusher

Another exceedingly useful type or secondary crusher for certain purposes is the swing-hammer type. This machine, however, finds its greatest usefulness in places where a high percentage of fines is desirable rather than objectionable, and therefore this type of crusher is of interest to the crushed-stone producer principally where he wants fine grinding of his material for the production of agricultural limestone, asphalt filler, stock feed filler, and other special fine products. Often a small hammer crusher adjusted for fine grinding will turn a waste pile of screenings into a valuable product that means the difference between profit and loss on an operation.

The greatest use of hammer crushers on rock crushing is in the cement industry where fine material for the pulverizing machinery is desirable and where the high ratio of reduction makes it possible to use a single hammer crusher to do the work of three, four or even more of other types of crushers. In cement-mill service the product of the primary crusher, running up to 10 in. and 12 in.—and even much larger if any primary crusher delivers a larger product—can be reduced to ¾ in. and under with a high percentage of fines in a single operation. This can be done in capacities up to 500 tons an hr.

You all understand the principle of the hinged-hammer crusher, with the rows of hammers suspended from bars passing through the discs of the rotar, and these hammers held perpendicular from the shaft by centrifugal force. The rotor, weighing up to 6 or 7 tons in the larger machines, operate at 700 r.p.m. or faster and the hammers deliver tremendous blows to the incoming stone, driving it against the breaker plate and shattering it by impact, then forcing the crushed pieces through the openings of the grate bars in the cage.

Such a machine is subject to damage from iron or steel which may accidentally enter the machine with the feed—a dipper tooth, wedge bar, or other foreign matter—unless the machine is amply protected. This leads me to the development in hammer crusher construction which I wish particularly to bring to your attention. Hammer crushers have been built with structural steel frames for a number of years, and such powerful construction is absolutely necessary to insure against eventual cracking or complete fracture of the frame under the enormously hard service which this machine undergoes. Ample protection is afforded, however, only if provision is made to safely and effectively care for stray iron in the feed. To accomplish this purpose there has been developed a device which is built into the hammer crusher as an integral part of it to remove the offending iron. This tramp-iron separator depends on the centrifugal action imparted to any iron in the feed to throw such iron against a heavy deflector block in the top rear part of the machine, and from the deflector the iron rebounds into a pocket provided for that purpose where it is effectually removed from the zone of action. This pocket can be dumped at the will of the operator and is usually done periodically, say each afternoon when the machine is shut down for the day. The pocket operates altogether automatically, and requires no power and no attention except for the occasional dumping.

Depletion for Tax Purposes

BECAUSE a domestic corporation holding all the stock of a foreign corporation is not allowed to take a deduction for depletion in computing its net income for income tax purposes a great injustice is done, according to the United States Graphite Co., which operates an important graphite mine in Sonora, Mexico. Recently a representative of the company appeared before the Ways and Means Committee and asked that the new tax law provide relief for a situation such as this.

New England Portland Cement and Lime Company

THE New England Portland Cement and Lime Co. has been organized at Rockland, Maine, to quarry limerock and deal in limerock products and cement; capital stock, $1,000,000, of which $500,000 is common and $500,000 is preferred stock; 20,000 shares of common stock of the par value of $25, and 5000 shares of preferred stock of the par value of $100; nothing paid in; directors, Adelbert L. Mills, president; Ada Barbour, treasurer, and S. T. Kimball, all of Rockland.

Report of Committee on Research of the National Crushed Stone Association

YOUR committee on research feels keenly and in a peculiar manner the loss to the National Crushed Stone Association of A. Acton Hall. As all know, Mr. Hall had the interests of this association sincerely at heart. Your committee has not only suffered heavily in the loss of Mr. Hall's ability to co-operate and advise, but the indirect effect has been serious to the committee. Those who are left, however, still retain the fire and urge of Mr. Hall himself in this important matter.

Your committee last year presented the results of an exhaustive study of the question of research, and its need in the National Crushed Stone Association. Your committee also co-operated last year in furnishing a program which included a discussion of the importance of research to this association and called attention to the opportunity for co-operating with governmental research activities and otherwise.

This association sympathetically considered the subject of research at that time and your committee was instructed to report further in the matter. We do not desire to burden you with a repetition of the discussion of the importance of research in the crushed stone business, which we have already presented to you, deeply as we feel its importance.

We are therefore confining ourselves to a brief re-emphasis of the matter.

We believe that every mother's son in the quarry business would get something out of a research program and that it therefore should be supported by everyone and *we so recommend.*

We realize very clearly that it is naturally very hard for some quarry men, in view of their knowledge of their own business, to see at the present time just where they will profit by a research program. This hard-headed business viewpoint is natural and seemingly very much justified. We understand from experience of other industries with research, that this skepticism is sometimes found to be correct in particular cases. Results from research on some problems are so difficult to obtain, that it takes years of effort to get tangible results, but even then the effort is generally a paying proposition in its stimulation of better methods, not to speak about opening new opportunities for improvement, as well as new avenues of development.

We realize also that there is a division zone among quarrymen which perhaps contains a considerable number who feel that there may be something in this matter for them, but nevertheless feel that the prospects are very intangible. Most of these men ultimately will join such a project either in our organization, or on their own account, when necessity forces them to it, if they do not do so before.

Your committee has talked with another group of members of this association who from the first have been certain of the *importance of research to them as a hard-headed business proposition.* These men appear to be increasing in number and the history of industrial research indicates that the increase in the size of this group is inevitable. They have lost none of their interest in the matter while it has been under discussion in our association. In fact, these operators have usually been interested in it years before it was discussed by our association, and a number of them have actively taken it up from time to time on their own account.

Is research a National Association affair or an activity to be undertaken by special groups? Is it possible to do research work of value in the promotion of just ordinary, every-day crushed stone?

It would appear that irrespective of the ultimate decision of this association in the matter of a research program, that the latter group of men will actively initiate a research project. It is understood, however, that these quarry operators will actively support a research program by this association. In the event the association, however, does not wish at this time to push the matter, this group of operators propose to start a research program of their own.

This special group for pushing the research project state they will be glad to have associated with them all those who care to come in and profit by whatever the program develops. The group, however, do not wish to spend time in persuading those who are not sure of their desires to support such a project. These quarry operators wish it distinctly understood, we understand, that all are welcome to come in who desire to do so.

We recommend that the National Crushed Stone Association enter upon a three-year research program, to be directed by a research committee.

We recommend that a research budget be provided of not less than $15,000 per year.

This expenditure would cover:

Director (part time)	$5,000
Clerk	2,000
Two assistants ($3000 each)	6,000
Office supplies and travel	2,000
Total	$15,000

With this expenditure it will be possible to inaugurate two or three specific projects and push them rapidly to a satisfactory conclusion. These projects should be agreed upon by the committee of this association. It will be found that our research staff will be able to run down and settle smaller matters as they come up or are suggested to it by us or as they come up in its work.

(This is practical *end* of report. The balance is suggestive.)

The objectives of our research program should be:

1. To lay foundations for a really comprehensive knowledge of the stone industry.
2. To furnish ammunition for later publicity and promotional work to create public appreciation and to promote business expansion.
3. To provide association members with a real comprehensive knowledge of their own material and possible fields in which its uses may be developed, and why.

Research Program

Suggested outline for 1924:

1. To make a market survey of the stone industry.

(a) A list of all the industries which use stone in any way, shape, or manner as a raw material.

(b) The tonnages used in each such industry; tonnage produced by the industry or a subsidiary; tonnage purchased from independent producers.

2. A list of the chemical and physical characteristics of stone used in or demanded by the various industries.

3. A survey of the knowledge possessed by quarry operators as to the uses made of their various products so far as they know, and why, so as to determine the natural limitation of various kinds of products and thereby avoid useless campaigns for expansion.

4. Compilation of a bibliography of the stone industry, and the source of current literature on the subject.

5. Arrive at such data as the dollar and cent value to the public and the tax payer of a cubic foot of gravel road as against a cubic foot of crushed stone road.

The possibilities of such a program have been discussed in our previous report. For instance, one of the members of your committee has made available research data secured at the expense of his company which well illustrates unexepected results of great value to the industry in general, which small research programs are already bringing to member companies in this association.

This company found its waste screenings

to contain a commercial proportion of sand. This sand was found by a constulting engineer of tests when used as cement aggregates to give in three days' time 120% of the strength with standard sand, and at the end of the 7-day period the strength was 165% of that using standard sand. The structural advantages of this are very real.

We could cite other similar definite or concrete commercial results of study and research upon the quarry or crushed stone business. We however do not feel it necessary to weary you with detail.

Respectfully submitted,

H. H. BRANDON, *Chairman.*

Discussion on Research

MR. SPORBORG: Mr. Brandon did not touch one element of this thought so I will undertake to do it for him. The fact is that we look upon these things in open frankness that the Ohio Marble Co. is an operator in chemical limestones. Mr. Brandon, I say this because I want to prevent the formation of the thought in any one's mind that this research program, this proposed program will not be used. I want you all to understand that. You all knew Mr. Hall, certainly, and you all know Mr. Hoagland, and you do not believe, I am sure, those men would do such a thing as to endeavor to bring about the taking over, by this association of ours of an activity which would turn more to their gain than to the gain of some one else. Maybe, I can say that better than Mr. Brandon could have said it because our company has no chemical limestone.

The line of thought that has been followed in the tentative mapping out of this research program is as far as you can possibly imagine, away from the thought that it should be along that line of investigating at the expense of the association the broadening of the use of chemical limestone for the benefit of the relatively few who may have chemical limestone some one of those who is ready to go into this thing. At a directors' meeting a year ago there was a discussion about it. Mr. Hall said at that time that we were going to put it over anyway, and some of the others say the same thing now. We should work together, pull together, and as to its going through, there is not any doubt about that, but let us not belittle our association by turning it down, saying that it is not the sort of thing that our association wants, and then allow it to come about that there are some members of the association who want to go into this thing and find that the association is not up to date and broadminded to an extent of doing it.

MR. RICE: I am the last one to throw cold water on any investigation. In the 25 years that I have been in business I would like to have pointed out to me, in some way, where a research committee would have done any good. So far as I am concerned, in our particular class of quarry, I have not the least idea where research would give us anything. If somebody is interested in this side of the question, tell us briefly what lines they think that they can follow to some definite conclusion, which would open up the question a good deal more. Like Mark Twain said when some one asked him to go hunting, and he replied by saying that he did not care to because he had not lost anything. (Laughter)

CHAIRMAN SCHMIDT: If the Research Committee could discover anything that would be useful in advertising the general product of crushed stone, undoubtedly, it would be a good thing for the association at large. I think the matter should be underwritten until those facts are brought forth, and then underwritten for the association if it develops to be of anything for the general good. I do not know what can be developed. Personally, I can only subscribe to the thought that if something does develop, as Mr. Brandon says, it can be given to the association, or the association can pay for it.

THE time was when all broken stone was a waste product. Concrete construction made it valuable. Can other uses be created for crushed stone and stone dust?

Our present status of finances would not permit us to authorize an expenditure of $15,000, unless it is underwritten. I think we will have to form an underwriting committee to carry it on or drop it.

MR. RICE: Personally, I cannot see where it would benefit us. Professor Withrow is here, probably he can tell us some of the things.

PROFESSOR WITHROW: It seems to me that there can be no question about the good that comes from research. In fact, that is the reason that we are here.

Out here the other day I saw a pamphlet telling about when the Pyramids were built, the expensive stone used, and matched in beautiful style. It was of enormous size, and much broken stone must have been wasted for each good stone produced.

Now, this association exists because some one found value for crushed or broken stone. This is what a research program proposes to do. You are in the business of cracking the stone which was then a waste product for which no use had been found. It took a long while to discover this; consequently, one must fairly and honestly take this factor into consideration before you can start a program.

From your own knowledge now, what are the questions that we would like to investigate? I listened to some remarks by Mr. Rice yesterday upon the results of extensive investigation of the influence of blasting upon cracks in plastered walls. The question about research that faces the human race, and, especially manufacturers, because they are the men who get out and take the risk of trying to make something that the public wants, is, "Are we going to be merely forced to do it?" Also, "Can we look ahead a little? Can we afford it?" Now, I think you can afford to do it. My job at the Ohio State University is to look ahead; what will we need ten years from now. In proportion as we do that, we have a better grasp on our business.

As I see your business there are three different sides, namely, sales, executive and production. I think there should be a central agency where the manufacturers should make some effort to answer those questions, if they are not now answered in our own experiences. Of course, we understand that a fool can ask more questions in five minutes than all the wise men could answer in a year, so we must organize along such lines as should show reasonable prospects. If we consider your industry from another point of view, the uncertainties are things that we must know more about. It should be evident that we ought to know more about the properties of all the different kinds of crushed stone materials that are furnished to meet the market demand, more about this demand. Then we ought to know more about the engineering and science underlying production, as well as the difficulties that the consumer has with the product. The thing uppermost in our minds should be, can anything be developed so as to make a new or expanded demand. The fines should be reduced to a minimum and we should be more interested in using the type of equipment from which we will derive the most benefit from the waste production point of view.

One outstanding illustration of the possibilities of research which amounts to a matter of many dollars a year saved is connected with the sulphuric acid industry. Before the war, heavy rock (ore) which is rich in sulphur came from Spain. We had some ourselves, but, unfortunately, on account of freight conditions it has been impossible to ship that material to the fertilizer manufacturing centers. The ore comes in sizes about the size of a man's head, and when this ore is put through the ordinary crusher you lose about 10% in fines. This rock is burned and from this they get the sulphuric fumes, or acid, to make the fertilizer. The fines were a very serious problem. On account of this material having to be brought all the way from Spain, the engineers began to investigate. They soon abandoned the old type of burner altogether, and developed a new type of burner which became so satisfactory that most of the plants now crush all the ore to fines and do not use the old lump burners at all. That is just an illustration of how our actual operations were revolutionized by our own in-

quiries. They have been forced to do it on account of the increased freight rates and increased cost of raw materials; now they actually manufacture a product formerly wasted.

CHAIRMAN SCHMIDT: Is there any more discussion? If not, what is the pleasure of this association.?

MR. GRAVES: Is there a motion before the House?

CHAIRMAN SCHMIDT: A motion by the committee on research.

MR. GRAVES: A motion then would be out of order.

MR. BRANDON: Your committee deliberately failed to make a motion on this subject. It was merely a recommendation. We have no desire to force this issue on the association if you do not desire it. The committee prefers that whatever action is taken on this project, be originated from the floor, or some other source.

MR. KOKEN: If it were not taken over by the association, what would be the method of assessment?

MR. BRANDON: The committee, itself, did not intend to outline any program of assessment. That was thought entirely outside of our responsibilities or duties. That matter is entirely up to the board of directors to act upon, being partially instructed by the association. If it becomes necessary to attempt to underwrite, our proposed program is to start out on this basis to secure a minimum of 15 producers who will agree to co-operate, to the extent of a maximum $1,000 each per year for three years; that maximum of $1,000 to be reduced just as much as it can be by securing additional members over and above 15. The goal is to secure 30 members at $500. We want a minimum of 15 to support it to a maximum of $1,000.

MR. GRAVES: The question is obviously so broad and has so many various phases that it seems to me impossible to come to the proper settlement of it here and now, and I, therefore, move that the recommendation of the research committee be accepted and referred to the Board of Directors for such action as they may deem desirable. Mr. Brandon can be assured that the matter will receive a full and fair hearing.

MR. BRANDON: I second the motion.

(The motion was carried.)

MR. BRANDON: Just one more word. Those in this assembly here today who think that they would be interested in co-operating and underwriting this project, which we all must recognize as the only way to get it across, please make yourselves known. I would like to get your names and addresses and some little expression from you as to your opinion on this matter. It is going to be rather difficult to pick out either 15 or 30, if we go into our list promiscuously. I would much prefer that you kindly make yorselves known.

Removing Clay from Screenings

CHAIRMAN SLOAN: We have with us Mr. Briggle of Texas. His subject for discussion is "Clay Seams" and "Screening Wet or Damp Stone."

MR. BRIGGLE: Gentlemen of the convention: We came up here to St. Louis primarily to find out how many people had clay seams, or what is commonly called "mud balls" in their quarries. I would like to see how many quarry operators here have this condition by holding up their hands. Some have a little and some have more and some have a great deal.

I want to know who is operating a quarry that has 25% clay? Texas has a very peculiar situation in having only a small amount of limestone. It is the largest state in the Union; in fact, it covers almost as much territory as the city of Chicago, and we believe that probably in the future Chicago will crowd us over into Mexico. (Laughter.)

We have a very small quantity of rock, and Texas is doing more building today than probably any other state in the Union. In order to build roads we have to have a great deal of material, and that state lacks limestone more, I suppose, than any other state. I think there is more limestone in the state of Missouri, 10 to 1, than in the state of Texas.

CLAY REMOVAL

ONE quarry in Texas is experimenting with tarpaulins to keep clay out of the quarry in rainy weather.

Here is a big problem. How can you keep clay out of your stone? How can you get rid of clay that gets through the crushers?

Further discussion of this problem by experienced operators is invited by the editors. Let's find out what practice is!

From the city of Denison, in a southwesterly direction to El Paso, is a streak of limestone that will probably vary from two to three miles wide, but on account of the clay seams there are few places workable.

Where we happen to be located this quarry or mill was built at a time when everybody had lots of money, in 1919, and everybody in Texas wanted a quarry, so they spent $1,000,000, locating the mill on an edge of rock that contains 33⅓% clay.

Now, then, in the last year and a half that I have been operating that quarry every time a carload of rock is shipped I throw away a carload of dirty rock, which piles up the amount faster in waste than the area we are excavating this rock. We have been forunate in one way, by having what are known as "waterbound macadam roads" for the last year, so that we have had a market for the output of this quarry; but the time has come when these people want more concrete rock, and you know that clay and concrete do not mix much better than asphalt and water, so we want to find out a way to remedy this situation. Of course, I know what you are going to say, "Why don't you wash it?" We just have barely enough water in that vicinity to operate our boilers. After the water idea is the fire idea.

I have with me a gentleman, Mr. Hyde, who things he has worked out a scheme of drying this product to such an extent that we can screen this dry dirt, and still make a rock that will do for concrete mixture.

That idea is going to be presented to this convention and I want everybody here who has an idea on this subject to express himself. If you do not think it good, tear it all to pieces. If it is a good one, help him along, because we are in a position where we need help, and we believe that the National Crushed Stone Association was formed for the purpose of helping the members of this organization, so, gentlemen, I want to introduce to you Mr. Hyde, who has this scheme in mind, and he will present it to you and then we will have a discussion.

CHAIRMAN SLOAN: We will be very glad to hear from Mr. Hyde. Mr. Hyde suggests that he had rather discuss the matter with those interested, and the reluctance of any one to leave the room shows that they are all interested.

MR. HYDE: The proposition, as has been worked out, is to clean the material as it comes from the quarry. Since we have not the water, my idea is simply to take the material, after it has been broken down by a primary crusher, send it to the secondary crushers and then through this scalping screen to a rotary dryer. A certain amount of rock 3½ or 4 in. that goes through this scalping screen, together with the clay and other smaller rock, to the rotary dryer, so that while it is being dried out the rock itself will act, in a way, like the balls of a ball mill, to break the clay and dirt down, so that it can later be screened up.

Now, after the material has gone through the rotary dryer it goes through a screen. We call it the second scalping screen, and by that time the clay and dirt will have been ground down so that it can be easily separated and you can then send your oversize to the crushers.

I will be glad to go into the details with any one who desires some information on a proposition of this kind.

CHAIRMAN SLOAN: Please bear in mind that Mr. Hyde will be very glad to answer any questions that you desire to ask him. May I say that it is the opinion of the chair that it depends on the character of your clay. If you have a feldspathic clay, and you place it in a rotary dryer, it is going to adhere to your rock, and it will be very difficult to get rid of it. I can conceive of all kinds of difficulties ahead of you if your clay is of a feldspathic nature.

Annual Banquet of the National Crushed Stone Association—January 22, 1924

THE meeting of the National Crushed Stone Association banquet convened at 6:45 o'clock, Mr. Otho M. Graves of Easton, Pa., toastmaster.

MR. TOASTMASTER: Gentlemen and members of the association, our guests and the ladies, who are also our guests: It seems perfectly clear to all of us that an attendance at this convention of over 300 and an attendance at this banquet of nearly 250 marks this gathering as the largest gathering of crushed stone men ever held in the United States. (Applause.)

We are all inclined to feel, perhaps, that whatever is the greatest thing in the United States is by the same token the greatest thing in the world, and yet, one thing is lacking, one face is missing. There has been among us in the past a man who has endeared himself to all of us by his quiet and forceful presence, by his own self-effacement, by his earnestness and sincerity of purpose, by his unquestioned ability and integrity, who has come to be one of the outstanding figures, not only in this association, but in the industry at large.

I venture to say that not one of us has held more dear to his heart the welfare of this association and cherished our success further than has he who is unable to be with us and whom our thoughts are at present seeking.

May I ask you gentlemen as a tribute of this association to A. Acton Hall, that we all rise and bow our heads in a silent prayer for a few moments.

[The audience arose and silently prayed for a few moments.]

MR. TOASTMASTER: Let me assure you that your surprise that I should be selected as toastmaster is no greater than my own. That toastmasters, like children, should be seen but not heard, does no more to enlighten me than it does you. But, like Pontius Pilate, I wash my hands of the matter even though you cannot.

I have nothing in particular to say to you and no reason for saying it. I cannot even plead the excuse of the man who leans over the rail of a ship on his first sea voyage; he is not interested in fish culture and has no particular grudge against the ocean, but simply feels that he has something to give up. It occurs to me that in our efforts to secure those material benefits for which we are inclined to think that this association is formed, we are in danger of overlooking those less tangible, but no less real things of the spirit which are ours, if we do but take them.

Immigration, fuel, freight rates, lower costs of production, improved methods of operations, hearings before the Interstate Commerce Commission and public service commissions are matters to which the association should and does give its attention, but greater than these is the blessing that it bestows upon us in bringing us all together for a few days once a year in fellowship and camaraderie, in an increase in pride and respect for our occupation.

It is largely through these annual gatherings that we have come to realize that within our ranks are men of such character and personality that they are admirably fitted for any line of endeavor they might undertake. Nor would we willingly sacrifice those friendships we possess and enjoy whose roots reach back into the soil of these gatherings.

Otho M. Graves

It is here that we come to see more clearly the pride in work and service to which we are entitled, and to realize more clearly the stabilizing influence on the industry of an association of this sort.

I believe in pride, not that self-centered, snobbish, egotism that sometimes masquerades under the name, but that pride which is based on a fair and proper valuation of service and work. There is no service to mankind more fundamentally necessary than that in which we are engaged.

Stone is a material which at least is as vitally necessary as any other which has ever entered into the construction work of man, whether a township highway or a century old cathedral. There is an elemental ruggedness, a simplicity and dignity in the quarrying of stone, which is lacking in those professions or occupations which do not possess such intimate contact with Nature. We share with other forms of mining and engineering a constructive element in distinction to the parasictic inherent in those professions, however honorable and necessary, which depend for their existence upon the frailties of man, whether physical, financial, or in human relations.

There is no finer tribute, I think, that could be paid to the standing, to the worthwhileness and to the growth of this association than that these, our guests, honor us by their presence tonight—men of distinction and large affairs.

It seems inappropriate that I should introduce them to you, but rather that we should introduce ourselves to them. If any of you are so fortunate as to live within the Lehigh valley, or not too distant from it, you must have heard to some extent of a rivalry which exists between the colleges located at Easton and at Bethlehem—Lafayette and Lehigh—to which the students give their full energies. I did not witness it, but I am told that on a dreary, drab day, in the fall of 1893, Lafayette was leading Lehigh in a classic football struggle by three points. Lafayette had the ball close to the Lehigh goal line, about 10 yards away, and seemed bent upon making another touchdown that would clinch the game. There was a fumble, the ball bounced behind the line of scrimmage; one Lehigh man broke through, scooped it and ran the length of the field for a touchdown. He has been in the habit of recovering "fumbles" ever since, and has made but few himself.

It is with the greatest of pleasure that I am going to introduce ourselves to this gridiron hero of other days who is now a most distinguished engineer and railroad president, Mr. Baldwin, I wish to introduce the National Crushed Stone Association to you. (Applause and rising greeting.)

The Case of the Railroads

By L. W. BALDWIN

Your toastmaster has, indeed, been kind in his introduction, and it is, therefore, rather embarrassing for me to talk to you on the plain subjects that I have in mind tonight.

I looked upon you, as I still do, as men interested in the construction and upbuilding of the country—men whom all railroad people are interested in—and I consider it a real honor to have the privilege of meeting you and talking to you tonight, and

consider that the property I represent has been honored in this privilege.

Because railroad transportation is a most important factor in your business, I suspect you are all more or less familiar with the general situation. It has recently been receiving a lot of space in the newspapers. Unfortunately, much of what has been printed was supplied by self-appointed and professional antagonists of the railroads and they have colored it to suit their own purposes.

Personally, I feel that great good will result from the situation. It is right and proper that the true facts and all of the facts should be placed at the disposal of the public, so that the public can weigh the evidence and form sensible and reasonable conclusions about the railroads. You gentlemen know that there are no deep, dark secrets in the railroad business. Every move we make, every cent we earn and every cent we spend is supervised by various government agencies. Unfortunately, however, too many of the great American public are inclined to let someone else do the research work, draw the conclusions, and frequently, decide the courses to follow, and blindly follow on.

The railroads, notwithstanding the progress they have made this year, are now, I believe, still confronted with grave danger. Since Congress convened, two months ago, at least 90 distinct measures have been introduced, each seeking to regulate the railroads. I believe, as has been said, these politicians have had their heads so close to the ground that they have not been able to see the light. My own judgment is that the people of this country—the majority of the people, by far the majority of the people—want to know that the railroads have the right and the opportunity to go ahead.

I believe that of necessity your interest being so interwoven with ours that your organization must feel that the railroads should have an opportunity to continue to function, to continue to grow, that they may take care of your commodity and other transportation necessities, in order that the country we all love so dearly may continue to grow and continue to be *the* country of this world.

There is some discussion, from time to time, of lower freight rates. For instance, among the bills introduced in Congress have been certain ones that attempt to reduce freight rates; others that attempt to take off other charges, notwithstanding we have the Interstate Commerce Commission, whose duty it is to regulate the freight rates.

I do not believe there is any railroad man existing who does not want to see the freight rates as low as they can practically be, and I mean by that, low enough to admit the proper handling of traffic, but not so low that it is impossible for the railroads to make sufficient money to permit them to grow as they should, in order to take care of these interstate transportation needs.

I hope that you will give careful attention to the matter about which I am speaking—freight rates—and bear in mind that the railroads require large quantities of money each year to make the necessary improvements, increase their facilities and increase their motive power and equipment, in order that they may be enabled to continue to handle the traffic as necessities require.

It is easily estimated that the railroads in this country need to put into their roadbeds and their plants a billion dollars a year for a great many years to come. Furthermore, when people are talking about the necessities for railroads, and the bearing that they have on freight rates, and the bearing that freight rates have on their own business,

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L. W. Baldwin
President, Missouri Pacific Railway

they must take into consideration a great populace depends directly and indirectly on the railroads.

There are nearly two million men employed by the railroads and directly dependent upon them, and there are nearly one-half this many employed in allied industries, such as steel, coal, lumber and construction materials, oil and other lines of endeavor. When the railroads are prosperous, they provide employment, not only for themselves, but for a multitude of other people, in order to produce the necessities for the increased plant and equipment of the railroads. Furtherfore, transportation rates unquestionably, do play a very small part in the prices of commodities.

We have heard in the past few months a great deal said as to the necessities for decrease in the rates on wheat for export. We have been told how serious the situation is, and how necessary it was to do something about it. It was, as I remember, two years ago, when corn was being used for fuel. Today, corn is very valuable, having increased two or three times over the price then quoted. It is not the transportation situation that regulates the price of these commodities, but it is supply and demand. Notwithstanding the difficulties of the farmer, the crops raised by the farmers in the United States this year were over $800,000,000 more than they were in 1922, and $2,000,000,000 more than they were in 1921. These figures were taken from a report of the Department of Agriculture.

It is not practicable to adjust railroad rates to take care of this and that and other commodities, but the law of supply and demand and the proper financial structure in other ways is what is necessary in order that the farmer may prosper yearly; and, further, he must have judgment in his business just as others are required to have judgment in their business.

The farmer is not always to blame and I do not think the present cry really comes from the farmer. I think it comes from the self-appointed guardian of the farmer who would take care of these situations by crippling the railroads. We do not want this class of regulation or legislation.

These bills that are introduced in Congress are not, in my judgment, for the purpose of helping the people, but for the purpose of so destroying the railroads as to bring about government ownership.

It is a fact that the average cost of transporting a ton of freight a mile in the United States is about 1 1/10 cents, while in European and South American countries the cost for similar service ranges from 2½ cents to 6 cents. It is true that the railroads of America are performing more efficiently than any transportation system ever performed in the history of the world. For instance, there are few persons who realize that the railroads, during 1923, transported a total of 50,000,000 carloads of freight, and did it without a serious car shortage or other inconvenience to the shipping and traveling public.

The railroads of the United States increased their number of cars this past year by 200,000, the number of locomotives by 3000 and, in addition, carried out a most extensive program of repair; and notwithstanding the large traffic that I refer to as having been handled by the railroads there was no congestion, but prompt handling at all times.

The railroads, of course, feel proud of this situation; they want to continue to give service. I do not believe that there are any railroad men; or, if any, few, who do not appreciate and thoroughly realize that what is necessary for the railroad is that they give service.

We want to be permitted to give service. We want to be permitted to earn the rates that will provide the facilities to continue to give service that you and other shippers require, in order that you can carry on

your business at a profit and pleasure to yourselves.

Now, I have not seen any great headlines in many newspapers about what the railroads have accomplished this year, and the reason, I take it, is because the people of this country are getting so used to good service. You know when we have something good there are only a few people who pay much attention to it. It is what we lose that we appreciate the most.

I feel that on account of the business you are in—the crushed-stone business—that you are largely in sympathy with the railroads. We use much of your product and will have always to use much, in order that we may have a stable and permanent roadbed to make possible the proper conduct of transportation. We feel, of course, as interested in your work as you are in ours, and, as you know, most of you have shown, from time to time, that you are interested in our work.

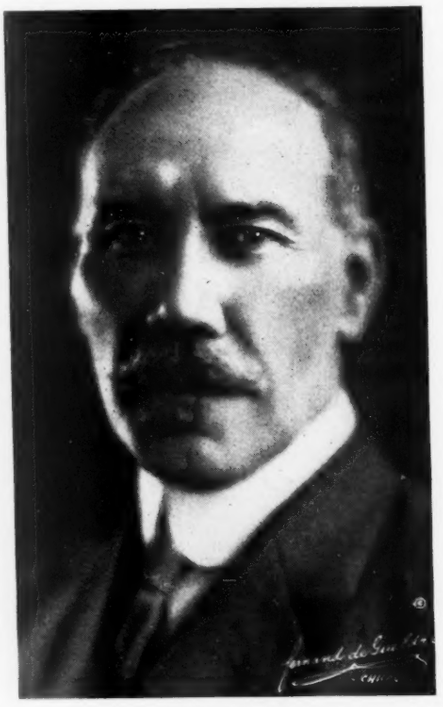
There is some discussion, from time to time, as to the railroads' position on highways—highway construction. I do not believe there is any railroad man in the United States who does not want to see good highways, and the more good highways that are built, I believe, the better it is for the country. But there are certain abuses in connection with their construction and upkeep that should be remedied in justice to the railroads. It is not fair to force these latter companies to pay the largest part of the taxes on a highway, which because of its geographical location runs adjacent to the railway right-of-way. It should not be compelled to pay all the upkeep of its competitor. Taxes should be adjusted so that the vehicles which traverse the highways and receive the most benefit from them should bear their share of the cost of maintenance.

In speaking of your business, I have frequently made inquiry of stone quarries, or asked the producers of stone, to anticipate their requirements with the distributor or consignee during the year and make an honest effort to put in storage facilities that might make it possible for these consigners to store their stone at the point where it is to be used. I think there is a great opportunity for you to work along that direction. I admit it is helpful to the railroads, but not only to the railroads, but to you and to the people who are to receive the stone.

There were times when it was impossible, and there will be times again when it will be impossible, for the railroads to give you all the cars that you want at a given time. It is not possible under the present rate structure. People in the stone business or any other business are not willing to pay a rate sufficiently high for the transportation of materials or freight of any character that would enable the railroads to buy sufficient equipment and to put in sufficient facilities to supply the big demand at all times; and it is, I believe, right that the distributors of such materials as stone should put in storage, during times when cars are not wanted, some of the materials that they will need and be of help to them when cars are so vitally needed.

I believe, furthermore, in this connection that many of you, by making such arrangements, can make more money than you could if the stone was not marketable, due to a car shortage.

I see nothing ahead of us this year to justify anything but good service. I believe that railroad executives have fixed in their minds and railroad men have fixed in their minds more than ever before that service is what the public wants and it is their job to give that service, but in saying



John J. Sloan, President-Elect, National Crushed Stone Association

what I did in reference to the storage of materials and storage of stone, it is not only to be helpful to the railroads, but helpful to industries generally.

I never have the opportunity to address any gathering of thinking people that I do not take occasion to mention the transportation act that was passed in 1920. It is true that in that act there are certain parts that may be improved upon from a railroad man's viewpoint, public viewpoint or labor viewpoint, but when you take it all and all it was, I believe, the most constructive legislation that has been passed for the regulation of railroads during the past many years; in fact, since the interstate commerce act. I feel it my duty, therefore, to ask you and through you, your representatives in Congress and other public men to be very slow in making any changes in the present transportation act.

This act had its first fair test last year. in 1920, part of the year only were the railroads operated by their owners; in 1921, there was a terrific slump in business; in 1922, there was a great bituminous coal strike, and railroads have functioned under this transportation act. Certainly, it is too soon to refuse to give this act a further and a fair trial. It is functioning and the railroads are functioning under it.

I do not believe it is necessary for me to bring to your attention the fact that the transportation act of 1920 does not carry a guarantee for the railroads. There have been a great many misunderstandings about that. It merely provides that the commission shall make rates that should give the railroads about 5¾% on the money invested, or upon the valuation fixed by the commission, and that is such that the earnings of the railroads lack several billions of dollars of the sum contemplated by the act. Therefore, there is nothing that the railroads have gotten out of this, except a reasonable amount of stability, and I would like for you to consider all of these features carefully and give the present transportation act your co-operation.

Ladies and gentlemen, I thank you for the opportunity of being with you. I thank you for the privilege of talking to you, and as a St. Louisian, I welcome you to St. Louis, and as the people of St. Louis have been so good to me, I, in turn, feel that they will do anything for you. If there are any wants that have not been supplied, it will be a pleasure for any St. Louisian to help take care of you. I thank you. (Applause.)

Making Chicago the Hub of the Universe

By JOHN J. SLOAN

MR. TOASTMASTER, Honored Guests, Ladies and Gentlemen: May I say that the remarkable subject assigned to me, "Making Chicago the Hub of the Universe," was not my choice, as I have no desire to wander among the stars, constellations and planets in describing Chicago.

Chicago, the hub of an empire, stretching from the Alleghany mountains on the east to the old Sioux mountains of Dakota on the west, from the Canadian line on the north, to the Ohio river on the south, is the center of a great district that in a large measure, is the bread-basket of the world. With a glaciated soil covering the entire region capable of growing all staple crops sufficient to feed the world, Chicago is the natural center of the richest valley on earth. Its favorable location was mapped out many, many years ago. 'Way back in early geological times, Nature laid down all of the hard rocks so many of you are familiar with. In later times various other classes of rock—then copper—was deposited in the North, iron ore in the Northwest, lead and zinc in the Western and Southern part, and as time went on down to the carboniferous age enormous deposits of coal in the Southern and Eastern part, now form an impor-

tant part in supplying the energy that is reflected in her industrial development.

Ages passed, and in glacial times the great chain of lakes were formed which gives Chicago a water level route to the sea that places all the ports of the world within her reach. And today a great plan is under way known as the Great Lakes-St. Lawrence river project for a deep sea outlet from the great interior section of our country, and when it is completed the most fertile and productive region of our land will have greater facilities for a world market. Ships from foreign countries are even now docking at Chicago's shore, and it was no later than 30 days ago that a ship load of coffee from Rio de Janeiro was received there, having come up the Atlantic coast to the St. Lawrence river and up that stream and the chain of lakes to Chicago. After her cargo of coffee was discharged she took a cargo of agricultural machinery and other supplies back to Brazil, again proving the fact that Chicago, though an inland city, is in every way a seaport.

With this favorable setting, in this vast domain, with great forests of various woods in all directions, with basic minerals, stones, clays and various other supplies that Nature favors this center with, the natural result has been the development of Chicago as an industrial hub, to furnish the raw materials for the many lines of industry which now characterize this district.

Our growth has been rapid. Conditions requiring improvement have crowded in so fast that it is imperative to give thought now to a proper solution of the great problems which are confronting us and which must be coped with. The growth of Chicago is unrivaled in the history of cities.

Chicago located about 200 miles from the center of the population of the United States lying as that center does to the southeast of Chicago, is the commercial center of a population of 45,000,000 people and the railroad center of the district, with 1400 trains every 24 hours entering the city.

Twenty-one main trunk lines start from Chicago and they represent 120,000 miles of railroad, or, relatively 50% of the entire railroad systems of the United States, which is the greatest in the world.

Scan the pages of history as you will, study maps of the world and no where else are the natural advantages that are tributary to the district outlined so outstanding and prominent as here. Is it any wonder that Chicago, with its location, starting with 4000 inhabitants in 1840, today in her 205 square miles area has a population of 3,000,000, growing at the rate of 70,000 a year, and 30,000 additional each year added to her suburbs.

Yesterday morning, when the acting mayor of St. Louis greeted us, he told us among your other achievements of a wonderful industry—the great electrical power plant, being built near this city of which we were glad to learn.

On the Chicago river we have an electrical unit of 300,000 hp. At present plans are developing for a much larger unit on the shores of Lake Michigan down near the Indiana line which will afford current for Gary, Hammond and the great steel industries, that line the shores of the lake for many miles, as well as for the enlarging needs of industry of that section of Chicago, which is rapidly becoming the workshop of the world.

Chicago is noted as you know, as the greatest meat, greatest grain, greatest lumber, greatest piano, greatest dry goods, greatest electrical supply, largest mail order center and the greatest agricultural machinery market in the world. In the produce and fruit trade along one short stretch of five blocks a business of $350,000,000 a year is done in supplying her own needs and as a distributing center for the tributary country. Chicago has 4500 miles of streets, many of them over 20 miles long. She has 40 city parks of over 6000 acres distributed all over the city—over 70 miles of boulevards, encircling the city and radiating in all directions, and in addition has 30,000 acres of forest preserves surrounding the city—playgrounds, recreation centers, great bathing beaches on the lake shore, and many other activities that cater to both young and old and add to the attractiveness of our city as a home center.

MR. SLOAN has a right to "boost" Chicago. He speaks with authority. He is the president of the Board of Local Improvements of the City of Chicago.

Its development goes on apace, and to show why Chicago is worthy of its destiny it is my privilege to tell you a little of the work of the department with which I am connected there. We have work planned now that in round figures will cost $100,000,000 and most of the money provided for. At present, we have a number of great street widening projects under way, involving 57 miles of street in which I happen to be plaintiff in 2900 lawsuits. The old city plan of 4-rod or 66-ft. streets no longer meets the requirements of a motorized age, so we are changing certain thoroughfares to 108 ft. in width, necessitating the removal of 4000 buildings, with many changes in bridges, viaducts, subways, lighting, underground work and paving.

Last year we widened 35 miles of streets. We paved 88 miles of streets, largely with asphalt. We laid 62 miles of water mains and built 60 miles of sewer from 4 to 11 ft. in diameter, this latter alone calling for an expenditure of $4,000,000. On account of the quick run of rain from roofs, concrete walks and paved streets, trunk line systems are necessary with reserve capacity to insure sanitary conditions, especially in built up sections where vacant areas no longer exist to absorb part of the rainfall.

We built last year 260 miles of sidewalks. We laid 36,000 sewer drains, and you can see the development in housing and building from the fact that 750,000 gas meters and over 700,000 telephones in use—also that $307,000,000 of building permits issued in 1923.

With these material factors it is necessary in these days to provide avenues of transportation to make the residential districts readily available to the industrial and business centers. We have found invariably that with these improvements completed, property values have increased, doubled, and doubled again, and there have been recorded instances, within the last few years, of a 500% increase in property, until today, in many sections of the loop district, property is selling $400 per square foot, and it pays a good return on that basis.

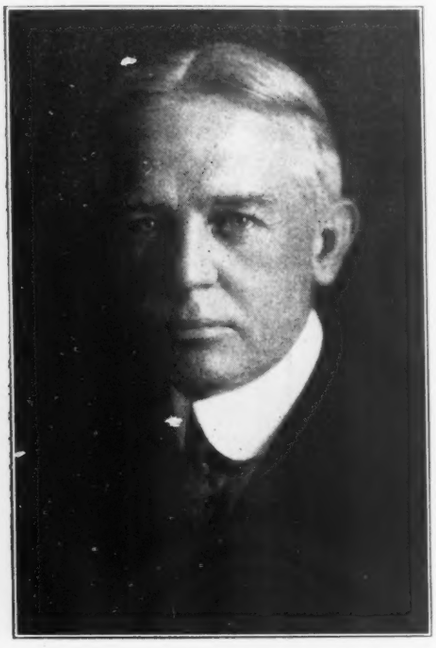
Chicago is now planning several great railroad terminals to replace the existing La Salle, Dearborn and Grand Central stations. The Illinois Central has started on an $80,000,000 terminal on the lake front—the New York Central in connection with the Rock Island system is planning a $150,000,000 terminal which will be ample to afford facilities to the tenant roads now in other terminals. Meantime the huge Union station after 10 years work is rapidly being completed. Those railroad projects are in line with the straightening of a section of the Chicago river—the transfer of about 45 acres on the west side of the river to the east side and the increase in values by adding to the area east of the present channel will pay for the entire cost of that work. However, it will have to be done by degrees, as the river is used for drainage.

Electrification of the various railroads coming in and out of Chicago is another feature on which millions are now being spent and will continue to be spent, and with all this we have a great fruit and produce market planned that will relieve congestion in the heart of the city. Our 21 railroads will have ample facility for transfer and storage, while better and more economical service should be afforded when this $10,000,000 project is completed.

These activities which reflect merely on the material side are not Chicago's only ambition. Her colleges, her universities, her art museums, her music studios have no parallel, we are told, anywhere in the country, and the cultural activities, which mean so much to the life of any city, are being developed to an ever increasing extent. Many commissions, voluntary associations, numerous committees from a host of clubs and societies interested in this phase of our city life, are always active.

Chicago is growing and growing fast. Where the end is, no one knows. I look to see an industrial development along Lake Michigan from the great industries of Gary, Ind., to the Wisconsin line, and all along the lines of the great railroads that serve

her. Chicago is about to add to her harbor improvements by building an inland harbor a short distance from the lake and connecting it up with the railway systems so as to afford better facilities for the present and to be ready to meet the increased demand now that the St. Lawrence-Great Lakes project is under way. It is no fancy statement when I say I expect to see within the next three years ships of all nations flying their colors in the harbor of Chicago, bringing to us products we require from foreign lands and taking away the products of the great Middle West, of which Chicago is but the hub—reducing carrying charges and making for a more ready distribution of the products of the entire Middle West, to all ports of the world who may be our customers.



John Rice, past-president, was called upon and told some of his experiences on a tour of the world in 1922-23

Chicago's destiny, in my opinion, was written in the stars. No place in the world offers the advantages in raw materials, manufacturing facilities, sources of energy and extensive railroad facilities to all points, and coupled with that wonderful water-way to the sea that is now about to be realized, Chicago will spread to the north, far to the south, and the Mississippi river is her boundary on the west.

Located in the path of the storms that forever circle in wide sweeps around the North Pole, bringing with them 35 to 40 in. of rain each year, thus insuring us against drought or famine, she further adds to the joy of living by being in a temperate clime with its vim and zest, which urges all of us to do our part to develop Chicago as a better and more attractive place to live in, as well as a dependable center with unrivaled facilities and opportunities for trade and industry. I thank you.

MR. TOASTMASTER: We wish to assure Mr. Baldwin that we realize that the mutuality of our interests with those of the railroads is such as to make their problems our problems. We have no desire to rock their boat even though we earnestly desire to rock ballast their road beds. Mr. Baldwin displays a knowledge of our industry which is most gratifying to all of us.

It was wonderfully inspiring for us to listen to the growth of Chicago. It is just a matter of a little time when the people in New York and Philadelphia may find themselves living in mere suburbs and residential sections of Chicago. (Laughter.) It is growing so fast that it must give one concern, but, however, if that is the program of Chicago, it could have placed its progress in no better hands than those of Mr. Sloan.

We sympathize with Mr. Sloan in regard to his 2900 lawsuits.

I think Mr. Sloan furnishes us an inspiring example of just the sort of man I am referring to, and to think that Mr. Sloan is all the time and every day a stone man, is doing this on the side, is sort of encouraging to the rest of us.

It is a good thing for all of us to get away from our own work and the railroads, because we almost feel a part of them, and hear what somebody indirectly thinks either of us or his work. It makes but little difference. It is the outside points of view which are helpful and refreshing.

Geology, of course, bears a very direct connection with quarrying, and Mr. Leighton, who is with us and who will talk presently is not only a distinguished geologist and author and lecturer (he holds degrees from several institutions of learning, including, by the way, Mr. Sloan, the University of Chicago), but has a real and definite personal interest in the stone industry. We are mighty glad to hear from Mr. Leighton. (Applause and rising greeting.) Let me say just a word. I doubt if anyone here does not know that Mr. M. M. Leighton is the chief of the State Geological Survey of Illinois.

Geology and Crushed Stone

MR. LEIGHTON: Members of the association and friends: I am somewhat embarrassed by the introduction, but we shall let that pass. One might think from the assignment of the topic, "Opportunities of Co-operation," that this, perhaps, was to be an extended speech, but I hasten to assure you that it will not be.

I feel quite at home as a geologist among stone men. From all that we have been hearing in this convention, I think we would say that we are still truly in the stone age, but, perhaps, we might also say that instead of being in Stone Epoch No. 1, we are in Stone Epoch No. 3. Going back to the time when man used as his implements stone taken from the loose debris of the earth's surface, shaping them at that time for his purpose, we trace the history of man on down through Stone Epoch No. 2, when the choosing of the site of a quarry offered no particular difficulty, but was simply a matter of opening a hole in the hillside and obtaining such stone as was necessary for the laying of the foundation, or the building of a humble structure; but that time has passed, and we are now doing things on a greater scale and the stone industry has become very complex.

We are interested at the present time, not only in the physical character of the rock, its hardness, its compactness, its resistance, etc., but also in the chemical composition of the rock. When we come to realize that the use of stone, at the present time, is not limited to the building of our magnificent cathedrals nor to the decorating of their

W. Scott Eames, past-president

most wonderful interiors, but also is used for ballast, for aggregate in concrete, for the manufacture of cement; and when in addition to all this we grind it up into fine powder, spread it on the soils of our lands in the hope and true expectancy of reaping better crops, we begin to realize that we are truly in the Stone Age No. 3.

Now, the part that the geologist is called upon to play is sometimes not quite so clear to us, I fear, but our state geological surveys do have a distinct duty to perform. As members of a great stone industry, we are much interested in knowing the distribution of those formations which are of the sort that we wish for our particular purpose, whether it be for ballast, for cement, for agricultural fertilizer or whether it be for the manufacturer.

We are interested in the occurrence of outcrops, which may be so situated econom-

ically that new sites may be located where there is an abundance of material available to run through the future years. We are interested in a proper description of these formations. We are interested in chemical tests. We are interested in physical tests. Who is going to take care of all these data, covering a whole state, and the publication of that information which may serve you as a guide, not only, perhaps, to the future development of your own property, but in location of sites elsewhere, if it is not the State Geological Survey or the United States Geological Survey?

So, from the standpoint of co-operation, I feel that the State Geological Survey has a distinct function to perform, and in the performance of that function, having been a geologist and having had a part in the study that has already been made in the state of Illinois in regard to its rock resources, I feel that you men of the stone industry, you operators, can also lend a hand, as the men of Illinois have lent us a hand, in placing as the disposal of whatever particular state geological survey may be performing the work, all the information you have, together with such data of production, from year to year, that will help us to keep an accurate record of the history of this great industry.

MR. TOASTMASTER: During the year in which Mr. Eames guided so ably and successfully the affairs of our association we grew not only to respect and admire him but to hold him in a deeply affectionate regard. Mr. Eames, we all know you as Scott. Won't you say a few words to us?

MR. W. SCOTT EAMES: Mr. Toastmaster, ladies and gentlemen: I want to say to you that I am very proud to be with you tonight, and to see the results of our work a year ago.

We missed one face, and I know if he were here he would also appreciate all the work that has been done. Do you remember how hard we worked a year ago to change certain features in our constitution? The result shows itself most readily in the large number attending this convention. I want to say this is due to Nathan C. Rockwood for the work that he has done, and I want to thank you all for the loyal support that you gave me during my term as president. (Applause.)

"Boosting" California

MR. A. R. WILSON: Mr. Toastmaster, fellow members of the association and our guests: It is hardly fair, I think, to call on me at this time, but Brother Graves always gives due consideration to the Pacific coast. Last year, I was the only representative from California at the convention. I was, therefore, made a director. There was nobody else to select, and I served as a director this last year and came again to the convention, not to talk of California, as we had a talk on California this afternoon by a representative of the Blue Diamond Co., and we, of the northern part of California, all recognize that the "spell binders" come from the South.

Of course, California is an empire, but some parts of it need to be developed. It needs capital, and needs men like you have here in this part of the country. It is true, we have plenty of gravel, sand, crushed stone, cement, but we are not the hub. Chicago, of course, will grow.

While California can raise everything we need, we like to raise and ship to other parts of the United States and to the rest of the world food products that you need.

Do you realize that we produced in the little city where I come from, Watsonville, one train of 25 cars fully loaded with vinegar? It left that city for Eastern points. I went down one day to the depot and watched the loading of dried apples. They were loading into one box car 175,000 lb.

A. P. Sandles, secretary of the National Crushed Stone Association since its foundation

of dried apples. I naturally asked the loader where they were going, and he told me to Copenhagen.

Do you realize with the dried apples, dried apricots and the canned fruits what the wonderful possibilities of California are? I imagine that if you go into the hotels of Chicago during the fruit season you will find that they have the fruit of California in those hotels, and another very important product that we are shipping out today, due to the Volstead act, is the grapes. Grapes and vineyard lands are worth more today than ever before the country went dry. That is a very remarkable fact, but they have a very hard time to get cars enough to ship the grapes to the Eastern points, so that our Italian friends can make their own wine. You know each man is allowed 200 gallons for his own use. They rather have the advantage of us who do not know how to make it.

We feel that we have much to learn from our Eastern friends. I want to learn how you gentlemen quarry your rock, grind it up and sell it. Of course, when you talk of selling your screening and so forth for agricultural purposes, we can not do that with granite. I was told today that we could and make people believe that was all right, but I do not believe we can. At any rate, we find plenty of use for our material, so we are very contented to buy more machinery and produce in large quantities. (Applause.)

MR. TOASTMASTER: California may be entirely self-supporting, as Mr. Wilson says, but we observe that he had to come as far east as St. Louis to find the young lady he married!

MR. FARRELL of the Manufacturers' Division, in response to a call for a speech from the toastmaster: Ladies and gentlemen: The Manufacturers' Division are really associate members of this association. Last year we met in Chicago and we had 12 at the luncheon. We had 30 firms represented at the luncheon today, with, I presume, about 60 members.

Being called upon to make a few remarks this evening is a little bit embarrassing, as we are associate members and we have been told to keep quiet, shut up, the lights have been turned out on us, and finally the doors were locked this afternoon, so it is rather surprising to find that we are so welcome. It goes to show, however, that parents are really proud of their children. (Laughter.)

MR. TOASTMASTER: We will never again ask them to shut up, although we may ask them to put up. (Laughter.)

I have very strict and positive orders from our president not to call on him to say anything. I ought to do it, but I am honoring his request just because he is our president, and because he made it. So I am going to ask him to stand up, say nothing and let us look at him for just a moment.

PRESIDENT SCHMIDT: I think all the members have seen and heard enough of me, so that I will say nothing more at this time. (Applause and rising greeting.)

MR. TOASTMASTER: There is one man among us tonight who can look back to those early days in 1918, in Columbus, Ohio, when this association was born. There were only about 20 present and ever since that time he has not only watched it grow, but he has guarded its infant footsteps with tender solicitude. He has been of more value to this association than we are sometimes apt to realize, because he has been helping us continually, inspiring us, giving us encouraging words and I would feel that this occasion was entirely incomplete unless we asked our secretary, Mr. Sandles, to say a few words to us. We want him to stand up and tell us that his heart is with us, as it has always been. (Applause and rising greeting.)

SECRETARY SANDLES: Mr. Toastmaster, honored guests, ladies and gentlemen: This is a splendid occasion. Over

here are the two flags, Old Glory and the Union Jack, the two flags of the world that speak the English language, and when those two flags remain as close together as they are tonight, the rest of the world had better behave itself. (Applause.)

We have our good Canadian friends here and they are a part of our institution. On our right, here at this table, is the sunrise of New England, and there is also Mr. Wilson, from the sunset shores of America. We have old Texas, Minnesota and New England here, and the acorn that we planted in Columbus, just a few years ago, has grown to the oak we have present tonight.

At this table tonight is an able talent as you would find on any program in any organization. The ramifications of crushed stone, as a human endeavor, have never been counted, and they are growing even today; stone is attracting the attention of everybody.

Just this little reminder to you men who are in the business. We did have our wonderful group meeting today about agstone. Do you quarrymen realize that practically every agricultural college, every experiment station, every farm institute lecturer and agricultural extension worker and county agent are practically your salesmen today, and you should get in touch with them, and that is going to be one of the big phases of this industry?

As has been mentioned here, we have a splendid exposition within our fold, and as comrades tonight are some of the keenest the best salesmen in the country. We have representatives of great institutions, of mighty industries that have been built by perseverance and experience and faith and we need not apologize for our organization; or our allied industries. I want to remind you here, in closing, of this story, and back of it is a moral for you.

When Andrew Jackson was President of the United States, a man was indicted and convicted of the crime of murder. After that man was sentenced to be hung and the date fixed, mitigating circumstances led President Jackson to offer to him a pardon. The man refused to accept it. The sheriff was puzzled. He had a man on his hands sentenced to be hung, a pardon for the man and the man refusing to accept it. The state's attorney was puzzled. He asked the judge what should be done about the matter and one court passed it to the higher court until it reached the Supreme court of the United States, and after due deliberation John Marshall, one of the greatest chief justices this country ever had, wrote an opinion. It was this: That the President had the right, full authority to offer the pardon, but unless it was accepted it was null and void, so the man was hung. He would not accept the blessing that was offered to him, and I can not help but remind you men who are here and the quarrymen who are not here, that it will be a blessing if you accept the offering of our blessing of this association. And, men, I hope you carry that message.

This is a splendid occasion here tonight, and our toastmaster has precided so gracefully that I am sure you are going to congratulate him, and that you are going to congratulate yourselves that such a splendid talent has been presented and that such splendid messages have been given to you. (Applause.)

Officers for 1924-25 Elected

WE, the undersigned members of the nominating committee, hereby nominate and recommend the following named persons as officers and directors of the National Crushed Stone Association for the year 1924:

J. J. Sloan, President, Chicago, Ill.
O. M. Graves, First Vice-President, Easton, Penn.
W. W. Boxley, Second Vice-President, Roanoke, Va.
James Savage, Treasurer, Buffalo, N. Y.
A. P. Sandles, Secretary, Columbus, Ohio.

Board of Directors

F. W. Schmidt, Morristown, N. J.
W. Scott Eames, New Haven, Conn.
John Rice, Easton, Penn.
A. J. Blair, Milwaukee, Wis.
W. H. Hoagland, Columbus, Ohio.
W. L. Sporborg, Syracuse, N. Y.
B. D. Pierce, Jr., New Haven, Conn.
J. J. Sullivan, Chicago, Ill.
Norman Hely, Cape Girardeau, Mo.
A. R. Wilson, Watsonville, Calif.
C. M. Doolittle, Dundas, Ont., Canada.
H. E. Bair Toledo, Ohio.
John Wunder, Minneapolis, Minn.
Stirling Tomkins, Tomkins Cove, N. Y.
J. F. Schroeder, Davenport, Iowa.
Thomas McCroskey, Knoxville, Tenn.
E. C. Dodson, Dallas, Texas.
Harry Brandon, Piqua, Ohio.
R. B. Tyler, Louisville, Ky.

Respectfully,
Signed: W. SCOTT EAMES,
Chairman.

Mr. W. Scott Eames read report of nominating committee.

MR. RICE: If there is no objection, I move that the secretary cast a ballot for the entire list.

The motion was seconded.

CHAIRMAN SCHMIDT: You have heard the report of the nominating committee, and the recommendations that the secretary cast a ballot in favor of the entire list. Is that the pleasure of the convention?

The motion was carried.

CHAIRMAN SCHMIDT: Before your president retires, I want to thank all of my associates who have helped me, and I wish the same support given Mr. Sloan. (Applause and rising greeting.)

MR. EAMES: I wash to introduce to you our new president, J. J. Sloan. (Applause and rising greeting.)

Mr. Sloan took the chair.

Remarks on Assuming Chair

CHAIRMAN SLOAN: I am not going to give you any talk now. I greatly appreciate the honor and confidence you gentlemen have reposed in me, and being fully cognizant of the importance of the industry and what it means to a well-conducted organization, I pledge you my best efforts with the time at my disposal to give to association matters. Membership in any organization, in my opinion, implies likewise certain responsibilities and duties and I look forward to the full, hearty support of all members with those suggestions and advices that an officer in any executive capacity needs from the men in the field pertaining to the betterment and welfare of his organization.

The short life of the organization so far and the success that it has attained, in my opinion, warrants the conclusion that as the days go by it will spread to all of the states, and that many new members engaged in similar lines of industry can gradually be brought within the fold.

You will not get any more out of it than you are willing to put in it, and it requires thought, effort and commingling with your fellowmen to realize where your best interests lie.

I ask for the support and assistance of every member of the organization to make it the success that I believe it will be in days to come, when it is a greater numerical success. As to our annual convention it is my personal view that questions pertaining to quarry and crusher details and operations should properly be referred to a committee made up of quarry superintendents and only conclusions reported to the general body.

I think one thing that we should investigate and develop is the social end of the convention. We should invite our wives and friends to come and visit with us. That will give us a better chance for acquaintance—some greater opportunity for the exchange of information and ideas and relieve the tension of convention details. More time should be given to group meetings, some time to promotional interests, to salesmen, and various other divisions of our organization; and only those questions of general interest should take up the time of the convention, giving us larger opportunity for the more personal matters that bring us closer in touch with each other.

It might be well for you to consider at this time where your next convention should be held. If agreeable a more Southern latitude might be deemed wise in which to held a convention and all your views will be gladly entertained. Any expressions or ideas on that point, I am sure would be welcomed by your new board of directors when the time is ripe.

Application of Geology to Quarrying

By H. A. Buehler
State Geologist of Missouri, Rolla, Mo.

ANYONE who has viewed the exhibits and looked over the membership of this association cannot help but wonder at some of the myths that have crept into literature. Why was the dim distant past called the Stone Age? T'is my contention they did not know even the first principles of the use of stone. We have found a million uses for stone. Its production has become one of the basic industries of the country, and if we were ever in a Stone Age we are in one now, and it wil continue in the future only more so.

Your secretary has asked me to speak about the application of geology to quarrying. I doubt if I can bring you anything new. I have noticed that most successful quarry operators are pretty good geologists. If they are not they pass on, and enter some business that does not require so much gray matter from the neck up.

However, the use of stone and its quarry possibilities depends on its geological history. It depends upon its origin, and upon what has happened to it afterwards.

I am not going into a long discussion of the origin of rock, this morning, but would like to restrict my remarks to a few applications of geological factors that I have seen in various quarries.

In general we have three groups of rocks. The igneous rocks, which include the granites, porphyries and trap rock. They are the oldest rocks and usually occur in large masses and may be very uniform in character over considerable areas.

The second group, or the so-called sedimentary rocks, includes the limestones, sandstones and shales. Now these are all laid down under water and they have been derived from the material that was brought into the ocean by streams. Limestones, for example, are usually the result of the accumulation of the skeletons of small, animals that live in the sea, that have the property of taking the lime out of the water. The third general group is the metamorphic rocks which includes the marbles, slates, quartzites and schists. These have been derived through profound alteration of the first two groups.

Limestone being laid down under water occurs in beds and successive ledges similar to boards piled on top of each other, and if the world had remained in its original position, we would have a world of practically one or a very few different kinds of rock, but, in general, the earth has passed through a very human existence. In her youth she had the colic, a little later she suffered from chills and fever; and it is true that she had many severe convulsions. As a result, we do not have a world of one type of rock, but in many places the oldest granites have been shoved to the surface, and we find due to this bending and breaking and denting and crumpling of the earth's surface a change in the formation. In some places we will walk on the oldest rocks while in other places we will walk on the youngest rocks. Due to this fact, we get a variety of stone in comparatively small areas.

Due to movement the rocks have been broken by joints and faults and shifted about so that in many instances they are not in their original horizontal position but dip at various angles and may be standing vertically.

Most of these factors can make or break a quarry operator, and while I think you all recognize them, I would like to consider a few instances where a little geological observation has either changed the operation or has shown where the quarry, in the first place, could have been greatly improvd.

THERE exists a very real opportunity for more co-operation between state geologists and the quarry industry. Crushed stone is one of the basic and in many cases one of the most important mineral industries in the various Eastern and Central states.

We were called, not long ago, into the northwestern part of the state, on a quarry that had been opened for highway purposes. The rock was quite unsatisfactory, and inspectors were rejecting it carload after carload. It was due to the fact that there were layers of shale interbedded with good stone. Hand picking failed to produce a clean stone and they were having a great deal of material rejected. In going over the situation, we found that the quarry was located near the base of the hill, the lower portion being covered with soil. Knowing the rock, and knowing the succession of the formations, we dug 3 ft., exposing a limestone from 18 to 20 ft. in thickness. Today, they are quarrying that rock with a great deal of success.

I bring out that point simply to show that a knowledge of the succession of formations may be a most important factor in opening a quarry.

The chemical composition is a factor dependent upon original deposition. Some limestone formations are quite uniform in their composition. Successive formations may be very different in composition. In making an examination of a large quarry, in the western part of the state, we found that three formations were exposed. The upper portion, which was rather thin, because of being at the surface, was very good. The middle portion of approximately 60 ft., was comparatively soft, and the lower portion was hard, fine-grained limestone. Both the upper and the lower formations were very good for quarrying purposes.

The middle beds, which contained considerable fine clay disintegrated to a slurry when wet and ground up very easily. The nature of that rock was well shown in its original outcrop. The upper strata exposed along the original hill projected, showing that it resisted weathering. The middle formation, while it was covered with talus, had weathered rapidly, as shown by under cutting, while the lowest beds again projected along the base of the bluff.

The nature of the stone in that bluff could be determined by the surface outcrop. Most quarrymen will take that into consideration, but it happened in this instance that it was not considered and the quarry has not been in operation for a number of years.

I had a little experience in a limestone quarry not long ago, indicating how bedding planes can either help or be a great detriment in quarry operations. In this quarry the beds were from 2 to 3 ft. in thickness with about a 60-ft. face. I watched one of the men working for something like a half hour trying to get one of the larger pieces of stone out of the bottom of the quarry, where it was tied in by the material above it. They had drilled holes back of the face to the bottom of the quarry, and loaded the holes quite heavily at the bottom and in blasting they kicked out the bottom somewhat with the upper beds settling their weight on the bottom stone, thereby tying in the broken rock below. In working at the bottom of the face, they continually had material that had been kicked out and the bedding planes inclined a little upward, and with the weight of the rock above it was almost impossible to get a piece loose.

It seemed to me that, had that operation been reversed and the upper part of the face blasted down so that the bedding planes were free, the profits in the operation of that quarry would have been very different, and probably not on the wrong side of the ledger.

We have in the southwestern portion of the state a quarry opened for the purpose of producing rock for one of the large buildings in the state. They put up quite a mill,

some $200,000 was spent, and opened the quarry along a small valley between two hills. They found that the rock was so fractured as to be almost unuseable. As a matter of fact, the waste was so great that the entire project was abandoned. Geologically that valley was an indication of a weak zone, probably fractured much more than the hills; and actual work found it no exception to the rule.

These examples illustrate some of the simple geological factors present in every quarry, and every successful quarryman takes them into consideration.

That brings me to the activities of the Geological Survey. Almost all the states support a geological survey, and most of them have rather detailed geological maps. In our own survey we are quite frequently consulted with regard to the character of stone from various formations. We have been running a number of experiments to determine the chemical composition of certain rocks for certain chemical industries. For instance, we have been searching the state for rock that is free from phosphorus in co-operation with quarry interests. Close co-operation is maintained with the highway department in obtaining stone for concrete construction, and the survey has reports available covering the character of the various formations of the state. These are supplied to the industry gratis.

Such co-operation develops the mineral industries of the state, which is the prime object of the survey, and I believe that if you establish your research division, you can find profitable co-operation in the various states with the geological surveys. I, for one, know that we would be glad to co-operate to the fullest extent with any producer who wishes information.

The Economics of Stockpiling

By H. E. Bair

General Manager, The France Stone Co., Toledo, Ohio

SOME of the largest contributing factors in the cost of production of commercial stone, that is ballast and concrete aggregates, sold in changeable climates are: First, the shortage of business during the winter months to the extent of reducing production below a profitable basis, thereby adding three to four month's overhead to the annual cost; second, the delays experienced during the operating season, by which production is reduced, caused by shortage of cars, bad weather, inability of customer to handle shipments, shortage of orders, breakdowns, etc.

The dream of all quarry operators is and has been to reach that heaven of quarrying conditions wherein a continuous operation on a paying basis is possible. A considerable reduction in winter overhead and costs of delays during the operating season can be nearly eliminated through storage during the operating season of those shipments lost from the normal production, by delays so long as the tonnage being shipped is paying operating expense.

To determine this cost; to the fixed charges add the costs of keeping the plant in operation. The latter items need not be absorbed entirely but nearly so. It is not profitable to continue operations for the sake of storage alone. The tonnage stored must be free of cost as the costs of producing this portion of the tonnage. Also the handling costs must be absorbed by the tonnage being shipped. In other words the cost of production must be based upon the tonnage shipped and not upon the tonnage produced. The tonnage placed in storage upon this basis and in an efficient and economical manner represents what might be termed deferred profits, realization of which is attained when shipment is made.

After determining that the plant can be operated upon the above mentioned basis, we face the most difficult part of the operation and that is to determine the most efficient and economical method of handling the tonnage to be stored to and from storage. The best method at present seems to be, if a considerable tonnage is handled daily, through the use of side-dump equipment for the large sizes and a crane for the smaller sizes, using the crane to reclaim all sizes.

Sufficient equipment must be provided to handle that tonnage produced on a normal basis, in addition to that being shipped, as well as to reclaim from storage that tonnage which it is possible to move during the peak of demand. It is also of vital importance that all of the storage is reclaimable in marketable condition and that sizes placed in storage are those for which there is or will be a market.

H. E. Bair

Many failures can be recorded of storage systems worked along economical lines but with all advantages offset by the loss in value of material in storage at time of reclaiming, caused by improper sizing and screening—weathering, physical makeup of the limestone, etc.

Summing up, if all the pitfalls most of us have experienced can be avoided, the winter overheard can be reduced by moving during the winter from the storage, that tonnage which it is not profitable to produce during the winter, and the operating cost during the construction season can be lowered by producing a normal capacity continuously, and the trades can be fully satisfied during the peak demand without increasing plant capacity, thereby keeping overhead costs to a minimum. The keystone of the whole principle involved is that a plant must be kept operating to capacity when it is necessary to operate it at all.

Resistance of High-Alumina Cements to Salt Water

OWING to the interest that has been aroused by "fused" or "high-alumina" cements, it has been found necessary to print additional copies of Bureau of Standards Technologic Paper 197, "Cementing Qualities of the Calcium Aluminates." This paper gives the data obtained from test pieces made of eight different cements of this type, burned in the experimental plant at the bureau. In addition to the usual small mortar test pieces required by the specifications for portland cement, 6x12-in. cylinders of a 1:6 and 1:12 gravel concrete were made and tested at various periods up to and including three years.

In general the results confirmed the statements issued abroad in regard to the early hardening of these cements as evidenced by the strength of 3145 lb. per sq. in. for a 1:6 concrete at the end of 24 hr., and 880 lb. at the same period for a 1:12 concrete. In view of the fact that the three-year data presented in the paper were obtained during 1920 and the data for the earlier periods at a time previous to that, the bureau is now engaged in making more of these cements to investigate such important points as the resistance to sea water and sulphate waters.

What Some Users of Crushed Stone Have to Say of the Future

Outlook for Railway Construction and Improvement

By F. J. Stimson
Chief Engineer of Maintenance, Pennsylvania Lines, Southwest System, St. Louis, Mo.

THE honor of appearing before you as the representative of the American Railway Engineering Association is very highly appreciated I can assure you.

Last year the question of having a representative of the American Railway Engineering Association committee on ballast appear before your body was placed before me as chairman of that committee and I selected Mr. Bloecher, as he as chairman of a sub-committee, was then handling the question of stone ballast and was able to address you quite comprehensively on that subject. The invitation this year came through the secretary of the American Railway Engineering Association, who, in turn, placed it before the president with the comment that the chairman of the committee on ballast seemed to be the logical man to respond and therefore the honor has fallen upon me. Unfortunately, I have not been employed in railroad work where stone-ballasted track has come under my direct charge and so am not particularly conversant with that form of ballast.

The relation of the railroad business to the industry which you gentlemen represent, however, is not limited by any means to the tons of crushed stone which may be used for ballast but covers a wide range. Let us look for a moment at various points of contact.

First—Did you ever stop to think of the volume of business you do in furnishing bulding materials for the construction of plants that depend wholly or in large part upon the railroad business for their existence? It is estimated that 10% of the business of this country is represented in the supplies used by the railroads. Is it not reasonable to assume that a large tonnage of your products is used in the construction of plants that are made necessary by demands of the railroads? Does not the extent to which such construction work is carried on depend entirely upon the prosperity of the railroads? Whenever the ability of the railroads to buy is lessened, the business that is dependent upon them slackens and the development of plants and facilities ceases. This is but one of the phases of the old story that when the railroads are prosperous all the country is prosperous. It is as idle to speculate as to whether the prosperity of the railroads causes the prosperity of the country or vice versa as it is to speculate on whether the egg or the chicken came into existence first. It is a fact, however, that whenever the prosperity of the railroad suffers a wide range of business also suffers because of it and your industry is one which suffers, not only directly by the loss of your business with the railroads, but vicariously through your loss of business with industries which depend largely upon railroad business.

F. J. Stimson

Second—The success of your operations depends upon the transportation service that is rendered you. It avails you little to have costly plants, well planned, well built, well manned and efficiently managed if your transportation service is such that only a small percentage of your potential output can reach the consumer. Your business is largely seasonal and demands ample transportation during your working season. To furnish that service means, speaking generally, railroad equipment and facilities that are largely in excess of what would be required for a business distributed more uniformly. The furnishing of such service requires capital and to secure capital there must be credit.

Third—The use by the railroads of crushed stone other than ballast, in construction projects which are large or small, just in proportion to the prosperity of the railroads, is no small item.

Fourth—When the railroads of this country are fully maintaining their facilities, they use iron and steel in large quantities. The renewal of rails alone consumes something like 2,500,000 tons annually. Other track material will run into a figure that is practically one-half as much. Steel for equipment, both renewals, repairs and addition, requires an immense tonnage. In fact it is estimated that 45% of all steel produced is used by the railroads. In the production of this steel the large tonnage of stone required is thoroughly appreciated by you gentlemen.

Fifth—And, finally, there is the ballast that is used by the railroads, both for renewals and new work. Both of these items depend upon the financial prosperity of the railroads and when the railroads are prosperous require an enormous tonnage of stone. The import of all of this is that your industry is interested more than the railroads themselves possibly in what is done legislatively to help or hinder the railroads. The air is surcharged with the poison gas attack that is being made by that element in our body politic, which is ready to sacrifice railroad efficiency and well being to their desire for self aggrandizement and glory.

They would increase wages so that the cost of transportation would be increased; they would decrease rates so that the railroads would have less income with which to meet their expenses; they would ignore the question of the cost of the service and give especially favorable rates to certain interests; they would restore to the 48 state bodies the power to fix intrastate rates notwithstanding the fact that those state bodies having no responsibility for the financial

results of the railroads engaged in interstate business are notoriously prone to fix rates favoring their own state with the calm expectation that the railroads will make up their losses at the expense of other states. They would withdraw the mandate of the I.C.C. to make rates such that the financial needs of the railroads are conserved; and finally, they go about the land shouting the lie that the earnings of the railroads are guaranteed. Do you know what sort of a guarantee in regard to earnings there is in the Esch-Cummins law? There is the positive guarantee that a railroad shall not be permitted to have for its own direct use more than 6% earnings. Six per cent on what? Why 6% on the amount which the I.C.C. finds is a reasonable value for the railroads. Do these load shouting demagogues accept as fair the valuation that the I.C.C. gives? Indeed, no! Selected by a senator from one of our Great Lakes states as the one body that had the honesty of purpose and integrity of action to find the proper valuation for the railroads at a time when he was cocksure that the valuation would be far less than the capital value of the railroads, he now finds that that body is dishonest, unfair and unreliable because they find that to reproduce the railroads of the country today at the unit costs in effect some eight years ago (and goodness knows those costs have increased some in the meantime), it would require some billions more than is represented by all the stocks and bonds at par value that are in existence.

What do they propose? That the railroads be given a value equal to the market value of the stocks and bonds. What is the most potent forces that has worked to establish that market value? The rates fixed by the government, rates of pay and rates for service. Of course, when the new valuation is used lower rates for service will be fixed (that is the only justification offered) and then the market value will drop and another cycle will be in order. How long, gentleman, could your business exist with such conditions surrounding it? About as long as the proverbial snow ball.

What is their purpose? They are greasing the ways upon which they would launch the railroads upon the sargasso sea of government control and ownership. Perhaps you gentlemen desire government ownership of the railroads (you will note that I said perhaps). If so, by all means use your influence to bring about the legislation mentioned as well as a myriad of other aggravating measures, mosquito like in their sting, that are proposed throughout the land. You know it is true that in some sections of the country the mosquitoes are so numerous that a man left without adequate protection will perish.

While everyone present knows the very great part that the railroads have played in the development of the country, it is such a commonplace fact that one is prone to think that the farms, the factories, the stores, the numberless industries were set down by some mysterious power with a fully developed self sustaining and profitable business ready to deliver to the railroads when they chose to come into the field. Of course, we know that such is not the case. We know that the pioneers in the railroad industry reached out into the wilds of our country; the wildernesses of our Great Lakes territory, the limitless expanse of our unbroken prairies, the unknown fastnesses of our mountains, with a courage and vision that has never been excelled in the annuals of any country. Did they reap financial reward? The financial skeletons that mark the trail of our railroad development fully match the bones which mark the course of the hardy pioneers who blazed their way through our forests; marked their trail through the Indian perils of our prairies and traversed the awe inspiring magnificence of our mountains.

Shall we deny to such loyal, invaluable assistance as was given by those early railroad builders, a just share in the prosperity of the country which they more than any other force helped to produce. Yes! more than any other.

About 20 years ago the crop of demagogues that then flourished coined a catch phrase which was taken up and really believed by worthy business men.

It was this, "The railroads are throttling business." Well, business was then and has continued to be and is a pretty healthy sort of a corpse. It really seems to have thrived on throttling. In all sincerity, I ask is there a man here who believes that the general business of this country could or would have been in better shape, more vigorous, more robust, more virile, had the railroads of the country not followed the general line of action which prevailed throughout the first 50 years of their existence.

Now what is it that all of us most desire? Is it not stability? The knowledge that as we get adjusted to existing conditions, they will not change? That is what the railroads want. The present legal confinements and entanglements are not all to their liking you may be sure but they say "leave us alone and we will adjust ourselves and develop so as to serve you efficiently." Let us hope that their desires will be realized!

If conditions continue undisturbed there is in prospect an enormous amount of railroad development. New second, third and fourth tracks, new sidings, new bridges and new facilities generally.

There is deferred maintenance to be overcome in all lines. The renewal of rail in many of our best lines has been woefully inadequate. This is very clearly shown by the record of steel rails produced in this country in the past eleven years. In the period 1912 to 1917 inclusive, the average tonnage of rails per year was 2,800,000. In the period 1918 to 1922 inclusive, the production was 2,340,000. A shortage of practically 500,000 tons in spite of the fact that the mileage has increased some and the average weight of rails has increased very greatly. Heavier rails require more tons per mile and it is the mileage replaced each year which counts.

The same general condition prevails in all lines of iron and steel materials used by the railroads and it is not necessary to burden you with a mass of statistics. The production of iron and steel to supply this shortage will require large amounts of crushed stone.

Ballasting also, like a poor tenant, is in arrears. Ballast that has become foul or worn out from constant tamping has not been renewed as it should have been. The extent to which ballast becomes foul is surprising. It is said that on some of our heaviest traffic lines on extremely heavy grades there is a coating of two in. of cinders (sparks thrown out by the exhaust of the engines) formed on the ballast every two months. These cinders work down into the ballast sealing up the interstice so that it fails to properly porform its function of affording free drainage. Large amounts of ballast are needed yearly to replace that which is wasted when the ballast is cleaned and to rejuvenate that which is left.

All the business of your industry indicated by what has been said can be assured, but first of all the railroads must have credit. How can credit be established? Primarily by demonstrating to the sources of credit that the railroad business is a sound dependable business capable of paying its way. Prior to very recent years experience has shown conclusively that money considered the railroad a poor risk. During the last few years the railroad business has shown that left without further hindrance, with no changing conditions hanging like the sword of Damocles over its head it can undoubtedly pay its way and establish a credit which will enable it to not only properly maintain its present facilities but to expand and develop so as to be prepared to handle the ever increasing volume of business which presents itself. Do you want efficient and ample service? You can have it if you will see to it that the railroads are given an opportunity to mind their own business.

Do you want active construction campaigns in industries dependent largely upon the railroads? You can have it if you will see that the railroaads are allowed to recuperate. Do you want activity in the steel and iron industry? You can have it if you will see to it that the mosquitoes are kept from worrying the life out of the railroads.

Do you want the large and ever increasing tonnage of crushed stone that the railroads need? You can have it if you will see to it that fairness, common business, honesty is accorded the railroads by their task masters who in the final analysis have to answer to you.

Winter Production of Crushed Stone

By A. P. Greensfelder

Vice-President, Associated General Contractors of America; Secretary Fruin-Colnon Contracting Co., St. Louis, Mo.

BEFORE undertaking to outline the subject assigned me by the chairman of your program committee, permit me, on behalf of the Associated General Contractors of America, of which I have the honor to be a vice-president, to extend to you the hand of co-operation. Your association represents the producers, who supply crushed stone to representatives of our association as consumers. This is the age of co-operation, and the Associated General Contractors have consistently taken the attitude that business progress and avoidance of misunderstanding can only come though contact and co-operation.

Your association endeavors to study nationally the problems of production and distribution of crushed stone. Our association has as one of its functions, the study of delivery of materials, of which crushed stone is a major item. Association work would miss its greatest opportunity if it did not bring with it the realization that better business conditions can only be brought about through ascertaining and studying the mutual problems of those who produce and those who consume. As general contractors, we have come to realize that people in glass houses should not throw stones, and certainly we do not propose to take any chances with throwing stones at members of your association, who, as initial producers of stones, would naturally have us at a great disadvantage.

Winter Production

The particular topic assigned to me today is the economic one of *winter production of crushed stone.* Until recently stone quarries, like most every other business connected with the construction industry, seemed to take it for granted that quarries should either reduce their producing forces or shut down completely during the winter months. Since the war brought with it a shortage of construction, the public, and through them the contractors as buyers, have been exerting unusual and continuous efforts in order to reduce or supply the unusual demand for construction work. Besides this, the tendency after the war has been toward speeding up the construction of permanent highways, which takes as its precedent the speeding up of the construction of railways immediately after the Civil War.

An immense amount of energy accumulated during the war period, and the manpower available upon immediate demobilization, which had had its original home ties broken, needed immediate direction. This encouraged our government to hasten to supply the growing demand for modern highways on account of the immense number of automobiles in service. Their distribution throughout the rural and urban communities in America, makes the production of roads one of the greatest civilizing influences in this country today. It is perhaps needless to comment to this audience on the increasing agricultural capacity and efficiency which good roads open up for every additional mile constructed.

We recognize, of course, that crushed stone for construction purposes is only one

A. P. Greensfelder

of the various factors in your business, and yet in addition to the use of rock by highway contractors and public authorities for similar purposes, crushed stone is also used by constructors for many other types of business and private construction as well.

That winter work is becoming more worth while each year, is due perhaps to the fact that we have a restricted immigration of labor, a tendency toward congestion in railroad traffic, and a growing demand per capita for modern structures. The Associated General Contractors of America have considered it one of their obligations to the public to urge winter construction in order to reduce the construction peak during the summer months. Since both labor and material costs are directly influenced by supply and demand, we realize that, unless construction work is spread throughout the year, a series of summer peaks would so increase labor and material costs as to temporarily reduce construction demands. Any temporary stoppage of construction work, however, tends to produce increased shortage and therefore increased demand again, with no elimination of the recurrent evil in sight.

The crushed stone industry is distinctly a branch of the construction industry, and as members of the same industry, our interests are common. It is our function to take your stone, convert it into concrete and thus sell it to the ultimate owner. We say to you: "Help us to help you by spreading throughout the year the demand for crushed stone." All of you at some time or another, and many of you frequently, mail us excuses instead of bills of lading for crushed stone. Your excuses are frequently lack of labor, car shortage, extreme heat, or lack of supplies. You sometimes tell us that your quarry machinery has broken down and that your stock piles having been depleted, we will have to wait until you can get into production again and take our share of the orders which have piled up in the meantime. We come to you with the suggestion, therefore, that all of us can conduct our business on a more sane basis if we work 300 days a year instead of 200 days as has been the custom up to the last few years. Our gain and your gain is that we increase our working possibilities about 50%; that with the same amount of equipment and capital investment you can produce more stone per year.

Perhaps a number of members of your association are already producing throughout the year, and on the other hand perhaps more of you should do so. Doubtless some will suggest a number of reasons why it is not being done, but upon analysis the chief reason is likely to be that it has not been done. The day of our fathers has long sped, and we sons of toil must solve the present-day problems along modern lines by the use of modern methods.

Quarry Problems

Some of the problems for winter production at quarries are more easily solved than others. Your main factors are supplies of coal, powder, and labor. Your operating costs, in addition to these, include equipment costs and boarding camp charges. Let us examine some of these factors. If you secure coal when it is plentiful in the sum-

mer time, your storage losses will be comparatively small and you will have it when you need it in the winter. Railroads and other big industries have come to realize the advantages of storing coal in advance of the winter season. Powder is just as effective in winter time, as long as it is not frozen, and even anti-freeze explosives are available. The ton-per-pound production is just as great in the winter time as the summer time. Have you ever stopped to realize how summer heat affects your labor and slows up their production? One quarryman has declared that he would rather shut down his quarry when it is 100 deg. in the shade and operate it a month longer in the winter time when it is only 20 deg. in the sun. I am inclined to agree with him that his efficiency per man-hour would be greater in the cold weather than in the extremely hot months.

If you have not already studied the problem, you will be surprised to learn that your labor turnover easily costs you from $20 to $50 per man. How can you expect to operate quarries with minimum labor turnover unless you can offer proper inducements to men by continuous operation of your quarries? We are solemnly assured in busy periods that good quarrymen are scarce, if not rapidly becoming obsolete. If that is your case, then the only way to keep good quarryman and encourage apprenticeship is to give them 12 months' employment.

In the latitude of St. Louis and Louisville, the amount of snow and sleet is not as serious a consideration as you might imagine if you will take a few simple precautions and provide steam heating facilities of even a primitive nature. With the modern steam shovel the handling of stone in the winter time is practically as simple as at any other period of the year. You have the advantage over dirt contractors in that frost does not bother your loading and transporting equipment.

Distribution Problems

Having quarried the stone, you naturally inquire into the distribution problem. Your first challenge is that, even if you quarry, crush, and load the stone, we, your customers, refuse to accept it. Perhaps so, and if that is the case, you and we must learn to sit across the table, not only at convention time, but whenever the distribution problem affects both of us. Perhaps in some cases it would be worth your while to stockpile the rock at the quarry, while in many other cases the contractor could very properly, with mutual advantage, stock it at his railroad siding or job site. The advantage to you in the first case would be that you could load cars faster than you could quarry and crush rock whenever cars are available. In the second case, we would have surplus material on hand whenever you could not ship, or on account of transportation delays. If department stores can move furs in August, we stone men ought to be able to find a way of moving stone in January.

In our case we need insertion in our contracts for monthly payments for materials in stock pile or delivered on the job site. In your case you may have to offer "seasonal discounts" in order to move your product. Seasonal discount is merely another term for sharing with the consignee some of your benefits of continuous production due to reduced overhead expense. If 2% for 10 days is a good business custom for cash discounts, so perhaps 5% or 10% discount in 30 days for material ordered and received during winter months would also be a good business custom. We might have to join forces and appear before state highway commissions, public works boards, and engineering and architectural societies, in order to urge acceptance of winter stone deliveries and secure proper payments for such deliveries. Such co-operation will be profitable not only to ourselves but to the public whom we serve. "But," you say, "shipment in open-top cars means possibility of frozen contents due to rain and snow en route, with subsequent freezing." Our answer is: "If cement companies can ship cement in open-top cars by using tarpaulins to protect this perishable goods from the rain, perhaps stone men will find it just as practical to do likewise." If steel rails can be shipped in cattle cars, perhaps we can be sufficiently inventive to ship crushed stone in box cars. Our railroad friends will need some education and proper urging, but tonnage in slack periods ought to be an inducement that railroads cannot always continue to overlook. Scuttle holes with trap doors on the top of box cars would be a simple way of loading and small side doors or bottom dump floors can be put in box cars the same as in open-top cars.

If railroads are justified in making excursion rates as inducements for passenger business, why can they not also be taught the advantage of seasonal rates for freight business? It ought to be worth just as much to railroads to keep their equipment moving, in slack periods as it would be to keep our equipment moving, and seasonal rates might properly be an inducement. During last year the railroads' peak was in the week ending September 29, when the total cars loaded were 1,097,274. A million loaded cars a week is becoming quite a usual thing, but with increase in population and subsequent increased demand for transportation facilities, it is going to behoove the transportation companies to use their equipment to the utmost.

Stone produced in the United States in 1922 amounted to about 81,000,000 short tons, according to a report published by the United States Geological Survey. In 1921 the output was 64,000,000 short tons, showing an increase of 27% for 1922. Owing to congestion of railroad traffic and the closing of quarries and crushing plants, caused by labor troubles, the supply of stone—more than 50% of which consists of crushed stone—was far below the general demand.

"Crushed stone" constitutes over 51% of the total stone output. Inasmuch as furnace flux, which is also crushed stone, amounts to 32%, it follows that more than 83% of all the stone produced by our quarries is immediately reduced to small fragments by crushing machinery before being utilized.

In 1921, 31% of the crushed stone produced was used for concrete, 29% for railroad ballast, and 40% for road material.

Supply and Demand

Rock in the hill is not as useful as rock on the bill, as you quarrymen can undoubtedly testify. It behooves you therefore to create a demand when your supply is greatest, and to also accumulate a supply to take care of your greatest demand. Peak production is not conducive to reduced costs. The cheaper you produce stone of the desired quality, sizes, and cleaness, the more stone you will sell and the more your gravel neighbors will envy you. Stone in the mountain merely makes interesting landscape, but profits in the bank will be made more certain by continuous production. It is custom rather than climate that we must overcome. Let us both take a hint from the housewife, who for ages has had wash day every Monday, but who now launders every day in the week, due to shortage in help, and if not fitted with electric washers and irons at home, collectively patronizes the steam laundry as well. Are we willing to admit that our better halves are better business women than we are business men?

The production of crushed stone is getting to be a tremendous business and well warrants the attention of the members of your association. As individuals you can do but little, any more than *we* can help *our* situation through individual action, but collectively we can exert a powerful influence.

May I urge, therefore, that your association appoint a standing committee on winter production of crushed stone, and assure you of our co-operation? If I have made any impression on you as to the possibility and desirability of producing crushed stone throughout the year, my effort has not been in vain.

Discussion of Winter Operation

MR. RICE: I am very much impressed with the paper read by Mr. Balmer "(Winter Production of Crushed Stone"), regarding the working of quarries in winter, and I feel that it would be very well for the executive committee to take up this question with the Associated General Contractors; and if there is anything to be done about it. Perhaps, we should also take it up with the railroads, in order to find out if they would give any consideration to this question, and if they would, then I think the highway departments would be well impressed.

I think this matter quite important, and I think the executive committee is the one to handle it.

Agricultural Limestone and Salesmanship

Discussion at Luncheon Meeting on January 21

CHAIRMAN LAMKIN: I came into the limestone industry three years ago. I looked around our plants from a sales' standpoint only. I missed everything that was in modern machinery, if there was anything. I found that one of my company's biggest problems was the disposition of their screenings. I told them that. They said "you had better forget about it; it is the bugaboo of the business; we don't know how to get rid of our screenings and we don't believe you do." I told them, "I am sure I don't know how, but I am going to spend some time and give some thought to the matter."

I spent three years in studying that problem and I told them that their methods were all wrong; they didn't agree with me, so I had to fight the thing through from the start. I looked at screenings from a selling standpoint only, and from 15 years' experience as a salesman I am satisfied that I have the answer and I am going to give it to you; and I know beforehand that you will not accept it, you will not believe what I say.

To start with, you are quarrymen; you are not salesmen; you are not going to be salesmen; you can't make salesmen out of yourselves and do justice to your quarry business, so my advice to you is to keep on being quarrymen.

Selling a Specialty

You cannot build yourselves from quarrymen to salesmen, and that is why today after three years in studying this problem I cannot answer questions relative to operations, because we have a man that takes care of that end of the business. Incidentally, I want to remind you that you are privileged to ask as many questions as you want to, and I will try to answer them so long as you stay along the lines of the discussion.

My investigations took me into many industries and after I was done I couldn't conceive of but one market, because you can't hit into half a dozen markets and make a success; you have to train yourselves along a certain market. Be sure it is right and go after it.

The market that I am suggesting to you now for the disposition of your screenings is the agricultural trade. That is not what you gentlemen want to hear me say, but that is where the tonnage lies. A lot of you gentlemen in this room can dispose of your screenings to the agricultural trade, but if you haven't the right kind of product don't try to sell it to farmers; it can't be done.

A few years ago the farmer bought his fertilizer on price and on price only; he didn't know anything about the quality of the material he was buying, he bought most anything. He got results because he was adding something to the soil it required. He may have added it in wrong proportions and wrong amounts but he got results. That applies to calcium, magnesium and ammonia; if you add them to the soils you will get results. Whatever product you add may get results, but will it get results on which you can build a business? I say no. You have to have the right product for the farmer or do not go into the game.

A little later you will understand what I mean. You can't take a product 90% pure and hope to compete against a man whose product is 98% pure. I have in mind a competitor who pulverizes stone much finer than

E. M. Lamkin

ours. He doesn't come within 12% of the purity of our product. We are getting the same price. His argument is that his product is finer and it is worth more. That is not true. You can only sell limestone to the farmer for one purpose; in other words, he buys it to neutralize the acidity in the soil, and it doesn't pay to try to sell it for any other purpose.

To hope to sell him a product that is 12% less powerful to neutralize the acidity in the soil is useless, and when he wakes up to what is being done it will be impossible to sell him a low class product. He will realize that every eighth or tenth shovelful of this material he shovels is impurities and you will not be able to continue long.

Possibilities to Be Developed

To give you an idea of the possibilities of the disposition of screenings if you have the right screenings, consider these figures from Ohio. In Ohio the yearly requirement is 3,000,000 tons. Now, that assertion comes from Dr. Thorne, substantiated by Dr. Baer of the Ohio State University. If we cut that down to 25% of their requirements we have 750,000 tons of liming material required in the state of Ohio annually.

So far as I can figure the production of screenings, that is, the byproduct I am referring to, going through a ¼-in. sieve is somewhere between 600,000 and 800,000 tons, so right now in Ohio we are only producing about enough annually to supply the demand.

The Farmer as a Buyer

One of you made the remark that the farmer was the worst man in the world to sell to; he wanted everything at a price. That is not true; that is a mistaken idea. The reason you think the farmer is hard to sell, and that he wants a cheap product, is because you know nothing about him; you have had a byproduct for which *you* hold no respect and you have gone out and asked the farmer to respect it.

He can't respect a product you do not respect yourselves, and the only way you can show respect for any commodity is to get a price for it. You are used to quarrying stone in large quantities, selling it on a competitive market at a low price and small profits. You have to get away from that idea of business and method before you can hope to succeed with your screenings sales. In some sections you can't sell your screenings as they come from the crusher; you have to prepare them, maybe to the extent of drying and pulverizing. If this is the case a higher price is necessary.

Our concern is in a particularly favorable situation in that we produce hydrated lime, lump lime, pulverized limestone in bulk and sacks, meal and screenings; so we have had experience all along the line. At the present time we are getting $10 a ton for hydrate of lime, at the plant, freight rate added, about $2.80 a ton, making the delivered price $12.80.

We are able to ship our products and compete in western New York, Michigan and over in Indiana. I heard a man from Indiana say, a few minutes ago, that he tried to give the farmers some screenings he had and they wouldn't pay the freight on them, but I want to tell you I put a star salesman in Indiana last year and he cleaned up on $12.80 hydrated lime, proving it can be done.

Dr. Ostrander, of Purdue, made the remark, in an open meeting, I was attending some time ago, that the producers of Indiana were not awake to the possibilities, and he went on to tell about a demonstration he was putting on, and he said one of the sales-

men was clever enough to pick up orders for 25 cars at one meeting, showing the Indiana farmers do want liming material.

I took a trip last fall, in Indiana, to see how my man was doing. He was picking up hydrate of lime orders one after the other. I went out to find out how he was doing it. He was applying just the simple rules of salesmanship, and that is what you have to apply to get rid of your screenings. You have to apply rules of salesmanship, and when a man sits down and says it can't be done, he does that because he doesn't know how to sell goods.

Some Principles of Salesmanship

I used to be sales manager for a concern that traveled a hundred men. One said to me I can't sell in western Pennsylvania because they are coal miners and don't know how to use our products; my California man said they don't use it on the Pacific coast. Two men sold me the idea that Kentucky and Tennessee wouldn't buy our product and we followed that idea for five years that it couldn't be done.

We sent two of our star salesmen out and they both fell down, and I will tell you why. One was a very successful man, a high salaried man. He got a salary and commission and the situation was satisfactory to him. It was a great effort for him to go into Kentucky, poor train service, not the best class of hotels, and little hope to dispose of our product, therefore his efforts were not what they should have been.

The same thing applied to Tennessee. I gave the matter a great deal of thought. I was unwilling to concede that it couldn't be done, and I said one day in a talk to the president, "It strikes me odd that there should be two states in the United States where we can't sell our product. If you will relieve me of my duties for a couple of months I will go down there and see what can be done."

To make a long story short, I went down there and I was so enthused that instead of staying a couple of months I stayed a whole year. The year I was down there I was on the same basis as the salesmen. That was one of my conditions, that I was not to go down there as sales manager but as a salesman. The company had prizes every year. They had their commodities split up in so many lines, and if you were successful in selling a certain amount you received a cash prize of $100, and so on.

After the year I spent down there I came back to the main office and was informed later at the national convention I won every prize the company offered that year, including the grand prize, in a territory where all the men said it couldn't be done—conclusive proof it can be done. Some of the men said it was because I was sales manager, but I didn't tell them I was sales manager; when I went down there my card was plain, the same card as the rest of the salesmen used, but I went down with the determination of putting it across.

That same condition exists today in the agricultural field. You can't put it across with the methods you are using, because I have followed your methods three years, and I am astonished at the methods the stone industry uses to get its products on the market.

Stone-Selling Methods Obsolete

You are using methods that were obsolete when I went into the selling game 15 years ago. The only way you can hope to put it across is to attend meetings like this, association meetings, get acquainted, get to know each other, know that one business man is just as fair as the other business man, be fair to yourselves, true to yourselves, true to the world and have some faith in your product.

Now, in disposing of screenings, as I said before, you have a vastly different condition than you have in any other product you have to dispose of. You should market this product the same as other products are marketed, and that is through dealers. You can only hope to dispose of your screenings through the dealer, and no dealer will take up your line until he can make a profit and I don't blame him.

In Ohio the average price as I mentioned before for pulverized limestone, in sacks, either 80- or 100-lb., is $5 per ton. The average freight rate is $1.40, making it $6.40, therefore it is impossible for the dealer to pay $6.40 and sell it at a profit.

We give him a discount of 50 cents. Take 50 cents from $6.40 you will find he is paying $5.90, and on an investment of $5.90 he makes 50 cents less than 10% profit, and that is the whole secret right there in disposing of your screenings.

QUESTION: What about in bulk?

MR. LAMKIN: The price in bulk is $3.50; in other words we get $1.50 more for sacked materials than we do bulk materials.

QUESTION: Does the dealer retail that at $6.40?

MR. LAMKIN: We give them a price of $5 at the plant regardless of the freight rate.

QUESTION: Do you fix the retailer's price to the farmer and the consumer; do you give him a limit on what he can charge to the ultimate consumer?

MR. LAMKIN: Yes. That gives him 50 cents profit from the $5 price and also 50 cents from the $3.50 price.

QUESTION: Per ton?

MR. LAMKIN: Yes.

QUESTION: Do you sell any direct to the farmers?

MR. LAMKIN: We do. Where we sell it direct to the farmers we protect the dealer.

QUESTION: How fine is that ground?

MR. LAMKIN: To 100% through a 10-mesh and from 50 to 60% through a 100-mesh.

QUESTION: Do you give the dealer the commission?

MR. LAMKIN: Always. We send him a check for the difference; in other words, we do a strictly dealers' business. Is that a success? Three years ago we had done nothing practically along the agricultural line. When I took the reins I let things drift along about as they were, just pulled in a little and tightened here and there. The first year I was there I let out every man we had because I couldn't make a salesman of him. The second year we doubled our business. The next year we doubled it again. The next year we didn't quite double it because our figure was getting too high; offhand, I would say a 50% increase in our agricultural department. We started off with a small tonnage, but as you think of tonnages it was quite a fair tonnage. We are making progress in Ohio away beyond your expectations because we know that there is a market there. We have at Marblehead a stock of 1,000,000 tons and we are going to dispose of it. That is why my company was willing to let me spend three years trying to find how to dispose of it.

QUESTION: That is in storage?

MR. LAMKIN: Yes. We produce annually about 300,000 tons and we propose selling all of them.

QUESTION: Is that in the open?

MR. LAMKIN: Yes. Some will have to be reclaimed.

QUESTION: Do you run it through pulverizers?

MR. LAMKIN: We put out a full line of hydrated lime, meal and screenings; I will give you an idea of what the sieve test of our product is: Hydrated lime is ground to such a degree of fineness that 99 to 100% goes through a 100-mesh sieve. Ninety-eight per cent is our guarantee. Our pulverized limestone, 100% through a 10-mesh sieve and 60% through a 100-mesh sieve. Meal is 100% through a ¼-in. sieve, 85% through a 10-mesh sieve, 53% through a 50-mesh sieve and 40% through a 100-mesh sieve. Screenings, 100% through a ¼-in., 80% through a 10-mesh, 49% through a 50-mesh, 32% through a 100-mesh.

QUESTION: How do you sell most of your screenings to the farmer?

MR. LAMKIN: Our price for screenings to the farmer is $1.25 per net ton, that is f.o.b. open-top car at the plant. No matter what town that goes into we pay the dealer a commission of 25 cents.

QUESTION: That is 25 cents a ton commission?

MR. LAMKIN: Yes. You can see that is not a fair commission; in other words, the freight rate in Ohio is around $1 a ton and the dealer pays it and he can't push screenings so long as that condition exists.

QUESTION: How will you remedy it?

Sell Something Besides Screenings

MR. LAMKIN: To start with, you will have to discourage the sale of screenings. You didn't think I would say that, but that is what you will have to do.

QUESTION: We don't want to; that is the form in which we prefer to sell it.

MR. LAMKIN: You have got a marketing condition you have to meet regardless of your personal opinion; screenings will not do: you will have to get them down to meal. When you get away from screenings you can get some money for your product.

QUESTION: Do you sack the meal?

MR. LAMKIN: No. The meal we are asking $1.60 a ton for costs little more to produce than the screenings. Factory price $1.60, freight rate $1, delivery price $2.60; 50 cents of that goes to the dealer; it costs him $2.10. On $2.10 he makes 50 cents profit, about 24%. Now, you have to talk your farmer up to the point of using it. You have to figure out a policy you can talk to your dealer about because it is the dealer who will sell the farmer, not you, and the sooner you realize that you cannot sell the farmer except through the dealer, the quicker you will succeed and that is the only way you will succeed.

Go into any rural community to any dealer that handles your product. He knows all the farmers by their first names; he can call them by their first names on the telephone and sell them car after car. As an illustration, in a certain county in Ohio we ran into an established concern that was largely in the business of buying hay from the farmers—they knew every farmer in the county by his first name—we asked them if they would take up the sale of our liming material. They did. They put over 8000 tons in one county and the first year. That is more tonnage than that county had ever consumed before they took up the sale of our agricultural products.

QUESTION: What is the total tonnage used in Ohio now?

MR. LAMKIN: This year I think it wil run about 200,000 tons.

QUESTION: Have you made an effort looking to the establishing of bins at every railroad station?

As to Station Storage Bins

MR. LAMKIN: I think it would be a fine thing, but I do not think it will happen. You have to get enough profit for the dealer so he will put your product in stock. That bin proposition in my estimation is a good dream. I dreamed it up to six months ago, when I found out what it would cost. I forgot about it, but your county agent and college professor are still dreaming it because they are not salesmen; they are thinking of the ideal condition for the farmer to get his lime.

QUESTION: The farm adviser thinks he is a salesman.

MR. LAMKIN: That's true.

QUESTION: He wants a commission the same as anyone else.

QUESTION: What will you do about the various modern farmers' organizations that insist on going to the fountain head of supply for their products?

MR. LAMKIN: Ignore them.

QUESTION: You can't ignore them.

MR. LAMKIN: You certainly can, because we have done it. You can't sell through your farmers' organizations, only through established dealers. You can't turn your product over to the county agricultural agent and expect him to sell it for you; he is not a salesman and if you go to him you ought to fail; you might think it is the line of least resistance, but it isn't.

How did we succeed in Ohio? By allowing our dealers a decent commission, and how did we bring these county agents to a realization that they were not salesmen? We have done it through organization, and the origin of that organization is the National Limestone Association. I was president of it two years, this year I am chairman of the board, and until you gentlemen come into that organization or form an organization of your own where you can get together and talk of the problem of disposing of your screenings you will not get anywhere with it, and so long as you discuss it from the standpoint of production you will not get anywhere, but some master salesman that knows the secret of marketing will put it across; in other words, I say this: If you have a problem in screenings, first decide if it is marketable to the farmers; if it is not, forget about it.

I tell you I have an answer for you. If you have a product that is marketable to the farmer, get some master salesman and he will put it across. You can't buy master selling experience for $200 or $300 a month. When you get ready to pay $5000, $6000, $7000 or $8000 for a salesman-manager, you will sell your products. That is the only way you can dispose of them. There is not an industry I know of that tries to hire such low priced salesmen as the stone industry does and that is the reason you are 10 years behind the times.

QUESTION: Does your plan contemplate financing the farmer?

MR. LAMKIN: No; we sell them on terms of 2% 10 days, 30 days net.

QUESTION: The farmers are all broke and haven't got the money and you will have to find some way of extending financial assistance.

MR. LAMKIN: You say the farmer is broke?

QUESTION: Yes.

MR. LAMKIN: That is because he has got you sold on that. So long as he has you sold on that idea you will not sell him anything. He hasn't us sold on that idea. The state of Ohio fell behind in the consumption of fertilizer and we went ahead on the idea of selling limestone. I think you will agree that the farmers are buying automobiles instead of putting their money into fertilizer and limestone.

QUESTION: Very true.

MR. LAMKIN: Why? The farmer has some money, but he isn't advertising the fact. The money goes to the first salesman that is clever enough to show him he wants the commodity he has to sell worse than he wants his money. The manufacturer fixes the selling price of his automobile. He has enough margin between the cost of production and the selling price to send a salesman out to the farmer and sell him a car, and while we are crying on each other's shoulders, that we can't sell the farmer, the automobile salesman has got his money and the farmer is happily riding down the roadway in his automobile and we have our stone piled high.

The farmer is broke, but not to the extent you think he is. He has a certain amount of money. You can't afford to hire enough salesmen to sell all the product you could accumulate in the next five years, the proper salesmen that would go out and sell the farmer, because you are too far away from the idea to be willing to do it. You have such a salesman at hand to go out and talk to the farmer, and that is Mr. Dealer; he will get orders for you, but he won't do it without a profit any more than you can hope to hire a salesman without a real salary.

QUESTION: This dealer who sells fertilizer, does he sell it on credit?

MR. LAMKIN: If the dealer is shown enough profit and he sees fit to sell fertilizer on credit there is no reason why he shouldn't, he can also sell his limestone on credit, but you will have to give him enough profit; in other words, the further away you, as quarrymen, get from selling the farmer the better. All of these credit risks will be taken care of by the dealer if you allow him enough profit to warrant it.

QUESTION: The secret of selling your automobiles is the fact they are sold on credit. They are financed. Now, you have got to work out some plan by which your local dealer can help him or finance him through his local bank. If you can't do that your game is blocked.

MR. LAMKIN: There is a lot of truth in what you say, but the real reason your man is buying an automobile instead of limestone is because he has been sold on the automobile and not on limestone. If you say credit is necessary we will have to arrange to extend him credit, but we haven't done it and we are billing 2% 10 days, 30 days net. We tried out a scheme during the winter season of permitting shipments during the months of December and January to be paid as of April 1, dating; that wasn't to the farmer but to the dealer that had a rating in Dun's and we knew we could collect our bills, but it wasn't very successful.

QUESTION: What is your definition of a dealer?

MR. LAMKIN: I would term a dealer

any man or group of men that were in business and had an establishment, not in their hat but in buildings; I don't care whether it is a co-operative grain elevator or merchant, whatever class of business he is in, provided he is close to the farmer and can sell him.

QUESTION: What does the dealer do with the farmer on the shipments in December and January?

MR. LAMKIN: The dealer usually extends the same dating to the farmer we extend to him.

QUESTION: That bin proposition. Does the farmer come into town and get it or does the dealer store it?

MR. LAMKIN: I would say in 99% of the cases the farmer gets his materials from the car on arrival. The reason is the dealer won't put the material in stock because there isn't enough profit.

QUESTION: Why couldn't you charge a man 50 cents a ton more than the one taking a carload? Wouldn't that be an economic proposition?

MR. LAMKIN: I think you could do that. I don't think there is any question but what the liming material sold to the farmers could be raised from 50 cents to $1 a ton and sell more of it. A higher price would instill confidence.

QUESTION: If you have your stuff where a farmer can drive into town with a load of grain, say, and go back home with a load of limestone, don't you think he will pay 50 cents a ton more?

MR. LAMKIN: I think so.

QUESTION: Then why not have a bin?

MR. LAMKIN: I think the most practical way there is is to put it in the dealer's warehouse.

QUESTION: There ought to be some place at every railroad station where a farmer can get limestone whenever he wants it.

MR. LAMKIN: There will be when you pay the dealer enough profit.

QUESTION: Do you believe there is any difference in the mental attitude of the farmer in Ohio, Indiana, northern New York as compared with the mental attitude of the farmer in southern Missouri and southern Illinois? Do you believe the mental attitude of the farmer is different in those respective communities?

MR. LAMKIN: I know it is. I will tell you why. I have spent our good money changing their mental attitude. The National Agricultural Limestone Association, whose headquarters are at Columbus, has spent real money to change the attitude of the farmer. I will tell you some of the things we did.

To start with, we have gone to the Agricultural College where we found their views were just the same as all other college views are. The farmer was paying too much for his liming material. That liming material was too high and the freight rate was too high. The college we found didn't know anything about it. They had nothing on which to base the cost of production, and I want to say now your screenings cost you more money to produce than any product that goes through your crusher, because it takes more crushing and screening to produce it, therefore you should get a better price for it.

We formed an "Agstone" association. We believe in ourselves and the product. Then as a body representing these producers, we invited the heads of the college to our meeting. We told them the reason we brought them there so they could understand us and we could understand them. We got on their feet, got them to express themselves, last week in Pittsburgh, Penn., Dr. Baer, head of the Soils Department of the Ohio State University, was at our meeting, came at his own expense; Mr. Stone from Pennsylvania, Dr. McCall from Maryland, Dr. Fletcher, from the U. S. Department of Agriculture; I can't recall offhand all the other prominent men that came to the meeting to address us.

I remember particularly Dr. Baer's assertion, almost what I repeated to you, that the college has sold the idea of liming material to the farmer, and he said further, "why in the devil don't you quarrymen go out and get the business?" And then he said "I will answer the question for you. Because you are not salesmen."

I remember a year ago he made that same assertion at a similar meeting and one of the quarrymen took exception to it. A year later when Dr. Baer made that same assertion they all clapped their hands and agreed with him. For three years I have been telling you quarrymen you don't know anything about selling. I have been telling the colleges that they don't know anything about quarrying.

QUESTION: You don't believe in utilizing the county farm bureaus and their propaganda?

MR. LAMKIN: The greatest help you have is your county agent. Don't ignore him but let him understand you will not sell your products through him.

QUESTION: Have you given consideration to the matter of selling your screenings through the local building material dealers? There is this to be thought about, in the first place, the local lumber dealer is a man who has better financial standing than the dealer in hay or fertilizer. In addition to the screenings being a fine thing for neutralizing the acidity in the soil, practically all of these screenings can be sold to lumber yards as concrete material. It looks like it is wise not to divide the proposition any more than possible.

MR. LAMKIN: You can't sell concrete screenings for agricultural purposes. They may be the same and come from the same quarry but you can't sell concrete screenings for agricultural purposes. If you ship out a car of concrete screenings put a bulk-head in between, this half of the car for your concrete screenings and the other half of the car for your agricultural products.

QUESTION: Where do you draw the line of quality as to the grade of your screenings?

MR. LAMKIN: I believe when you go below 90% pure stone you are getting so low you can't compete for the business. You must have 90% calcium or magnesium carbonate. If you have less than that you will not dispose of your products long to the farmer.

QUESTION: Which is the best, lime carbonate or magnesium carbonate?

MR. LAMKIN: The answer to that is availability. I don't care whether it is a high magnesium stone or a high calcium, provided it is available. That is the first thing to take into consideration, is it available? It must be available. How much of it is available. And that is your selling talk.

QUESTION: You say Dr. Baer said that the Ohio University had sold the farmer on the use of limestone. What did he sell him on? The use of pulverized limestone or byproduct screenings? In Illinois they have been sold on the idea of byproduct screenings at a low price.

MR. LAMKIN: That is what we found in Ohio. That is the trouble with the business. In Ohio we changed that. Remember this: while you must supply the farmer what he needs, what he needs must be consistent with what you produce.

QUESTION: Give him what he needs, not what you want to sell him, is that it?

MR. LAMKIN: Yes, but what he needs must be consistent with what you sell him. You can't build a business selling him the dumpings from your quarries. You can't take a lot of dirty screenings and tell him he can have them for 50 cents a ton and get by very long with it. You may for a while, but I can send a good salesman there before that car gets in, and he will show that farmer what he is getting, and the first thing you know he will wire you a cancellation, because the salesman will show him he is not getting his money's worth. That is the most serious thing we are up against. You must sell them the right product at the right price. Screenings today ought to bring $2 per ton at the quarry.

QUESTION: What are you going to do to combat that when the universities tell them to buy more tons of screenings for less money than your pulverized screenings?

MR. LAMKIN: Use a little phychology. Form an association or go into one of these now formed, and we will tell you what to do. We have done it. They are following the lines of least resistance. The colleges believe that all over your state there are piles and piles of agricultural screenings that you don't know what to do with it, and that you are glad to give them to the farmers. The college says, "buy what the market affords, the chances are you can get screenings free by paying the freight on

them as they have already been thrown away. That is the thing to use."

That is the reason your college is in the attitude it is in. When you go to the expense of taking some of the leading men in the state to your quarry and show them the cost of production, then they will understand.

QUESTION: Is it not a fact that the higher the price is and the more refined the goods are the better they will sell? In other words, are you not increasing your hydrate sales in greater proportion than your screenings sales?

MR. LAMKIN: Well, no, I couldn't exactly say we are. That depends generally on the section; and the amount of work you have done. Ohio was a screenings section, low-price screenings; as low as 50 cents a ton. It is fast going to the higher priced commodity. Our pulverized limestone sold three years ago at $2.72 at the plant, that is, in bulk. It has gone up to $3.50. The price in proportion has gone up on sacked material, $1.50 higher. We find since the price went up we sold more of it. We found since we put the $1.50 difference on the sacks, where we sold 100% in bulk, the condition changed the other way; the farmer is willing to pay us the $1.50 difference for pulverized limestone, and that difference between the bulk and sacks, which is $1.50, takes care of the whole situation.

MR. SLOAN: Up in Wisconsin we have run up against a serious proposition. Within the past two years various manufacturers have come into the state with small portable gasoline units running a jaw crusher with the small pulverizer. Three or four of these fellows have formed a co-operative association and they go around the state with this portable outfit, with the result that today they sell one-third of the limestone; on account of our higher cost of production, with the freight rate added, we find we are out of the running when it comes to competing. The University of Wisconsin has credited this local stone as being the best in the United States and they tell the farmer it is cheaper. All the salesmen from here to hell won't change that condition. It is hypnotism rather than salesmanship that will put a thing over in opposition to natural laws of supply and demand.

MR. LAMKIN: If we are hynotizing them in Ohio we are lucky because we are getting rid of our screenings. Are we, with a tremendous investment, going to continue to throw on the pile 10% of our production, which may be 10% of our profits, or greater, and let these little independent crushers come in? We have run into that in Ohio. Ohio, I think, ranks second in the United States in the production of stone. We have quarries all over and we ran into that condition; we ignored it, marketed our products; we have arguments enough against it.

For instance, using some of our arguments, we say we have a product that is 98½% pure. We analyze it every day. We give you a definite guarantee. We ship you a product you know is worth every dollar we ask for it. With these little crushers you do not know what you are getting. You do not know whether it is suitable stone, whether or not it will become available. If business in the country could be done that way we would not have our great department stores.

Mr. Sloan brought up something I was forgetting to state. A few minutes ago I said you were not successful in marketing your screenings, and that is one of the reasons why, and to forestall that condition, as we did forestall it in Ohio, is to educate your farmer to buy from a reputable concern a reputable piece of goods with a definite guarantee, and I believe you will overcome it. You may have to have certain laws to protect your business. There is no reason why you should not have laws to protect your business, but I will say this, if you put out men to create anywhere near the demand they should for your product you will not have to worry about the small crusher. To repeat, the condition in Ohio, we require 3,000,000 tons per year; if we could be assured of half of that, 1,500,000 tons, we won't worry about the little crusher because I don't believe it can compete with us.

QUESTION. Is it not true that these little fly-by-night concerns are really a help in spreading the propaganda that lime is a good thing?

MR. LAMKIN: I never thought a competitor was a detriment to me in any business.

QUESTION: Right there, if Mr. Sloan would have the farmer analyze his whole cost, his turn-over in labor and time involved, and the fact that machine probably would not run over a month or so out of the year and at the end of the year is not worth a darn, I think the farmer would find he can buy his limestone better than crush it himself. We passed through that phase and the state did help those fellows getting organized but they are gradually disappearing.

MR. LAMKIN: That is our experience in Ohio.

QUESTION: If the farmer is ten miles from a railroad he is justified in having one of those.

MR. LAMKIN: At the present time the farmer is not in a mental condition to organize or run a business. That has been proven time and time again. We found he does not succeed in buying these crushers and putting them on the farm.

QUESTION: How can a small quarry hire a $10,000-salesman to sell $10,000 worth of limestone?

MR. LAMKIN: That can be easily answered. If you have a small amount of screenings to dispose of you don't need a star salesman to go out and get rid of a little bit, but we are talking of 1,500,000 tons. If you are the head of a small business. I assume that you are sufficiently intelligent to take care of it yourself.

QUESTION: Why can't you depend on your county agent?

MR. LAMKIN: Because he has a selfish motive; he is playing the farmers' game and not your game. Your county agent is not a business man. I do not say this disrespectfully. He is the best salesman you ordinarily have. There is not an industry in the United States that is getting so much propaganda to the consumer as the agricultural liming industry is. I haven't found a state college yet that would not give you every bit of a boost you could expect. I haven't found a county agent that wouldn't. I have not found a farmers' organization that wouldn't, but first you must impress on these fellows your business is your entire business.

QUESTION: We have had a county agent sell 30 carloads in a week's time and we don't need any better salesmanship than that.

MR. LAMKIN: What did he do with the money?

QUESTION: He didn't get a thing out of it.

MR. LAMKIN: You are foolish for asking questions if you have a unique proposition like that.

QUESTION: You say the county agent is not the man to sell through but we are doing it.

MR. LAMKIN: There are isolated cases like that, but I am talking about the industry as a whole. You will not do it through the county agent; if you try you are beating around the real issue. Your county agent is not a salesman. He is not permitted to do it legally; it is against the law.

QUESTION: In the first place, he is only temporarily in office; he is not offered and does not expect money as recompense, but he is permitted to sell it.

MR. LAMKIN: You can realize that as soon as he starts in selling it, he is human; how would you feel if you were county agent and saw the big profits being made from sales? Put it on that basis.

QUESTION: At the price of $10 for hydrate of lime, what can you charge for limestone meal and give the farmer the same ultimate result at the same price?

MR. LAMKIN: There again you demonstrate salesmanship. Hydrate of lime at $10 a ton; $1.60 for meal. There is a pretty wide spread. If we go to a farmer and he says he thinks hydrate of lime is the thing he wants, we tell him we think so too; if the fellow next door wants meal we sell him what he wants. We sell it to him in any form he wants; we will let him use his own judgment.

CHAIRMAN: Gentlemen, the meeting upstairs is waiting on us and I think we had better adjourn.

A vote of thanks was extended Mr. Lamkin.

Selling Quarry Products

By Russell S. Rarey
Marble Cliff Quarries Co., Columbus, Ohio

MONDAY morning we listened to the various directors of this association tell of their highly satisfactory year's operation—satisfactory particularly as to the excellent demand for stone products; we also heard belief expressed that 1924 would be a year comparable perhaps to 1923.

Under such favorable conditions, it would seem that a paper relative to selling quarry products might not hold much of interest. However, it is not my intention here to discuss, in much detail, selling against competitors in our own field, but rather—let us place a broader meaning on our subject matter and agree that real selling relates to the retention of and extention of present uses and to the development of new uses for quarry products.

The stone industry is highly basic and reaches far out into various branches of human endeavor. Without stone the industrial world would stop tomorrow. Certainly then in such an industry we can find a fertile field for constructive selling.

Salesmanship cannot be confined to the sales department alone. Back of every sales organization should be found a spirit of co-operation on the part of the management looking to the constant betterment of the product and the service. Crushed stone is a repeat order business; being a low grade commodity, profits on initial orders are oftimes more than consumed in the development of new business. It is, therefore, the repeat order that yields the profit and repeat orders can only be expected when high-grade material is sold and excellent service is rendered.

Let management then get its house in order to the extent of backing up its sales departments with quality material and quality service. Given these factors the distribution of quarry products is now largely in the hands of the sales executive.

Since constructive salesmanship has to do with the extension of old uses and the development of new uses, sales departments should constantly endeavor to hit upon plan or plans that will create new business. With this thought in mind let us review the quarry products group by group.

Generally speaking, crushed-stone products are divided into five groups. Some operations cover all five groups and some, of course, are limited to but one. These five general groups are as follows:

1. Flux and chemical stone.
2. Railroad ballast.
3. Commercial crushed stone.
4. Commercial ground stone.
5. Manufactured products using stone as a base.

Flux and Chemical Stone

Flux and chemical stone requirements are usually covered by contract for periods of considerable length. Such contracts are naturally placed with only such producers who are in positions to satisfy a given requirement with a particular stone. There is little, therefore, that can

Russell S. Rarey

be accomplished by a sales organization in the matter of increasing flux and chemical stone sales. When a blast furnace needs flux it wants flux and when steel orders are nil, all the intensive stone selling that can be brought to bear will avail but little. Certainly salesmanship can and should be employed to secure orders and contracts against competitive stone companies but the long term nature of flux stone contracts greatly reduces opportunity for sales effort. The best sales argument that can be presented to a contract customer is current and continued good material and good service. When the time comes for contract renewal, he will not look elsewhere.

Railroad Ballast

Generally speaking, railroad ballast is handled in a manner much the same as is the marketing of flux and chemical stone. Railroads are disposed to buy only from producers who have definitely established their ability to produce a satisfactory material in adequate quantities. Aside from the salesmanship that may be employed in furthering the use of stone ballast as against gravel and slag, there is little that can be done by a sales organization. Railroads usually buy their ballast from producers located on or near their own rails. Here again, the opportunity for sales effort is curtailed.

Crushed stone, ground stone, and kindred and allied products seem, therefore, to offer the greater opportunity for constructive selling and the remainder of this paper, therefore, shall be confined to the discussion of such groups.

Commercial Crushed Stone

Road Stone—Perhaps the largest single demand for stone other than flux and ballast comes from road work. Road work is largely a matter of governmental activity functioning through and by reason of certain laws. Without these laws, road work as now carried on could not be. It is, therefore, of vital importance to every material producer—be he stone man or otherwise—to so conduct himself and his business that public sentiment favorable to continued and increased road building be developed and maintained.

It is not here implied that material interests should plan legislative authority for making raids on the public purse, but rather all legislation should be beneficial and constructive and so planned as to give the taxpayer maximum return. On such a basis the stone man cannot lose.

In addition to molding and shaping sentiment for new favorable legislation, there is much that can be done under the present statutes. Oftimes county commissioners and township trustees are desirous of proceeding with a more or less extensive road program but find themselves apparently hampered by statutory limitations as to bond issues, tax levies, etc. With the multiplicity of road laws now on our statute books, there is usually some way to proceed with road construction when the proposed work represents an actual need. In such cases if the stone salesman is thoroughly familiar with his road laws, he will be able to point out ways and means whereby the necessary funds for the construction may be made available. Such salesmanship is highly constructive and as such is commendable.

With adequate road funds available there is much work yet to be done before

we can exchange our road stone for tax dollars. The matter of selling the macadam road type against other types requires deep consideration and much sales effort. We believe that in the past entirely too much stress has been given to the lower initial cost of the macadam road. True, low first cost is a factor much in our favor but, in the stressing of this point, we have permitted the public to lose sight of the excellence of a properly constructed macadam road. It is my firm belief that a modern penetration road, well built and of the proper thickness, is one of the best roads that can be constructed. If, incidentally, this road is also cheapest to build, easiest to maintain and most pleasant to ride upon, so much the better. The point, however, is this—Talk quality, allow no one to go unchallenged when he refers to macadam as being suitable only for secondary road system. In every section of this country instances can be cited, proving conclusively that bituminous macadam is a high type pavement. Why then be satisfied with a lesser classification?

It is my belief that secondary roads should be of macadam. Macadam is the only road that can be economically adapted to constantly increasing traffic burdens. A lightly constructed macadam road is entirely adequate for light traffic; and as the traffic burden increases it is an easy task to provide additional thickness to the original road. This operation, known as "progressive road construction," can be repeated as often as increased traffic justifies; the last course, built to accommodate heavy traffic, being of the penetration macadam type.

In our campaign for macadam type as against competitive roads, our argument should be constructive. Otherwise we will soon find ourselves in disrepute with the engineering and contracting fraternity with the result that the reputation of both the macadam road and the stone producer will suffer. In some states where the stone man is not subjected to competition from the gravel producer in finished concrete aggregate, the matter of the type of the road is not of so much importance to the producer. However, in Ohio, where gravel is accepted for concrete road construction, the issue is vital and much work must be done on behalf of the macadam construction. Happily, since we believe macadam is not only the best road but also the most economical, our efforts in furthering macadam construction is more of a pleasure than of a task.

Construction Work

Aside from uses already mentioned large quantities of stone are used for building construction. This material enters largely into concrete work. In such cases the placing of the business is usually governed by quality, service and price. It is vital to the stone producer, therefore, that he make certain first of all that his product is unquestionably good; second, that his service either compares favorably with or excels that of competitive producers. Lastly, he should be interested in being able to provide both high quality material and high grade service at a price that will permit the use of his particular material.

Each succeeding year finds engineering specifications growing more exacting and each suceeding year finds the producer called upon to provide better service at highly competitive prices. Specifications on concrete aggregate have become so rigid that it may be advisable for stone producers to wash their commercial limestone. Such a practice will result in many benefits. First, we will be able at all times to definitely assure a prospective purchaser that he will be served with clean aggregate. At the same time by retaining and properly grading the extreme small sizes of grit, you will be able to market what we at Marble Cliff term our limestone sand. The grading of this product can be so definitely controlled that the sand will pass the most rigid specifications as to size and cleanliness. Aside from the sale of the sand itself, this material is of further benefit to a stone producer, as it forever answers the old time alibi of the gravel man—"No gravel—No sand."

In selling stone against sand and gravel, the stone man is confronted with the fact that his stone is considerably higher than prices on competitive materials. Therefore, it is of importance that in selling, we thoroughly recognize and push to the limit the advantages that may be ours on account of better quality and better service; also proper stress should be given the lighter weight of stone as compared with gravel, the angular shape of our material as also compared with gravel as well as the advantage of stone over competitive materials in fire walls, etc. There are also instances where a white-stone-like appearance is required in the finished concrete. At such times the producer of stone and stone-sand has a distinct advantage. The construction field is so large and its requirements of aggregate so great that any manufacturer that produces a high grade material can by hard and reasonably intelligent work secure at least his share of the business.

Commercial Ground Stone

It has long been the practice of limestone producers to market a portion of their screenings for agricultural purposes. The tendency on the part of farmers and the agricultural experimental stations is to require finely ground limestone for such work. In line with these requirements, many producers have installed and are continuing to install grinding machinery for the further reduction of screenings and small stone sizes.

In addition to the agricultural field there is market for considerable tonnage of specialities such as chicken grit, stucco stone, terrazzo stone, etc. These sizes are referred to here as ground stone, inasmuch as they are usually tailings screened out during the process of pulverizing. Another market for large quantities of finely ground stone is had for asphalt filler requirements. This stone must be more finely pulverized than agricultural stone being approximately 85% through 200-mesh. At the present time there are being developed many additional markets for ground stone as fillers. The rubber industry is showing a keen interest in the possibilities of the use of extremely fine ground stone in the manufacture of tires, etc. Also there is effort on the part of some stone producers to supply pulverized stone to replace kaolin as a filler. Use of stone as a whiting substitute is also becoming extensive. Generally speaking in this field the finer the stone and the purer the product, the higher the price.

Manufactured Products

In most every plant there are periods during the year, particularly during the wet and winter seasons, when a considerable portion of the quarry output is improperly screened and cannot be marketed through the usual channels. Also in some plants in all seasons, certain sizes may be produced in excess of the market's apparent requirements. The matter of proper cleansing and sizing of the waste stone is largely a matter, of course, for the management and production department. In most cases the installation of rescreening devices or washing units will permit the stone now regarded as waste to be made salable and marketed for concrete aggregate, etc. However, there are times and places where the crushed stone market is now taking its limit for construction purposes. In such cases it is often possible to develop markets for the excess sizes by converting them into finished products. Where the output of excess sizes is large and where the quality of the material will permit, the stone may be converted into cement, lime, etc. Here, of course, the investment will be large and for that reason may perhaps not be desirable or possible. However, in a smaller way, excess stone can be manufactured into various other finished products. Among these might be classed concrete block, tile, cement brick, roofing, etc.

The cement block field seems to be fairly well covered with the exception perhaps that most block producers of today seem to regard their product as being suitable for foundation work only, whereas we believe that by proper salesmanship a greater use of cement block for walls above the water table could be easily secured. In this the stone man might well co-operate with the block producer.

The use of cement brick seems to be gaining considerably throughout the country, particularly in the extreme East and West. It is doubtful if cement brick can

be manufactured profitably in certain sections of this country, such as Chicago district, where common clay brick are produced in large quantities and are marketed at low prices, or in the Ohio district where the manufacturer of cement brick would be subjected to low price competition from the sale of the cull brick from the Ohio face brick plants. Aside from these two districts, and perhaps others where conditions are similar, we believe the matter of producing concrete brick from excess sizes merits the consideration of the stone producer.

In the foregoing we have endeavored to cover the field of "Selling Quarry Products" in only a general way. Certainly there are methods and practices that will suggest themselves to each individual producer. Generally speaking, however, we feel that the stone man is engaged in the production of so basic a material that if he will but give his selling proper thought and sufficient work he will experience no great difficulty in moving his output.

Mileage Scale of Rates in California

EFFECTIVE December 8, 1923, the Southern Pacific Co., which serves nearly all the quarries in the state, abandoned the old established rates and put into force the following table of rates on crushed rock, gravel and sand, based entirely on the mileage basis between various points in California.

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Cancels
First Revised Page — 81

SOUTHERN PACIFIC COMPANY LOCAL AND PROPORTIONAL FREIGHT TARIFF—C.R.C. 2673. No. 330-E

DISTANCE RATES ON CRUSHED ROCK, GRAVEL SAND (except molding sand) ETC., AS DESCRIBED IN RULE NO. 40 SERIES, PAGE 19, CARLOADS.
Minimum carload weight 60,000 lb. (except as noted)

APPLICATION OF RATES

Distance rates named in this item will be based upon short time mileage from point of origin to destination, except where short time mileage (due to use of constructive mileage) makes a higher rate than would accrue via longer route, apply lower rate via the longer route.

BETWEEN	AND	DISTANCES (See Note 2)	Rate in Cents per 100 lb. (See Note 4)
Points in California, Santa Margarita, Caliente and north, except points east of Roseville, Calif., See Notes 1 and 3.	Points in California Santa Margarita, Caliente and north, except points east of Roseville, Calif., See Notes 1 and 3.	40 miles and under	2½
		50 miles and over 40	3
		60 miles and over 50	3½
		80 miles and over 60	4
		100 miles and over 80	4½
		120 miles and over 100	5
		140 miles and over 120	5½
		160 miles and over 140	6
		180 miles and over 160	6½
		200 miles and over 180	7
		220 miles and over 200	7
		240 miles and over 220	7½
		260 miles and over 240	8
		280 miles and over 260	8½
		300 miles and over 280	9
		320 miles and over 300	9½
		340 miles and over 320	10
		360 miles and over 340	10½
		380 miles and over 360	11
		400 miles and over 380	11½
		420 miles and over 400	12
		440 miles and over 420	12½
		460 miles and over 440	13
		480 miles and over 460	13½
		500 miles and over 480	14

NOTE 1. In determining mileages to be observed in constructing distance rates, 150 per cent of actual mileage shall be applied in the following territory:
North of Red Bluff, Calif.
Between Vasona Junction and Santa Cruz, Calif.
NOTE 2. For table of distances see Southern Pacific Co.'s Distance Table No. 420-C (C.R.C. No. 2677) supplements thereto or reissues thereof.
NOTE 3. Distance rates named above will not apply via Saugus, Calif.
NOTE 4. Effective October 24, 1923, all specific rates named in this Tariff applying between points located within the territory covered by Distance Rates shown in Item No. 1120-A are cancelled.

The Railway Case

By J. J. SLOAN

MR. STIMSON'S paper, in my opinion, carries a warning, gentlemen. You have only to look at the newspapers, today, to see that many citizens take no interest in the public's affairs, and in some of our Middle Western states only 50% of the people vote at the presidential elections. It naturally follows that a very small minority of our citizenship is reflected in elective offices.

When you glance over the papers and see the amount of English money sent to the United States for safety to invest in acceptable securities, you can readily see how our prosperity is threatened when people fail to take an active part in maintaining a stabilized, conservative form of government, and when a government goes down in any community, all suffer.

New York Stone Plant Prepares for Big Year

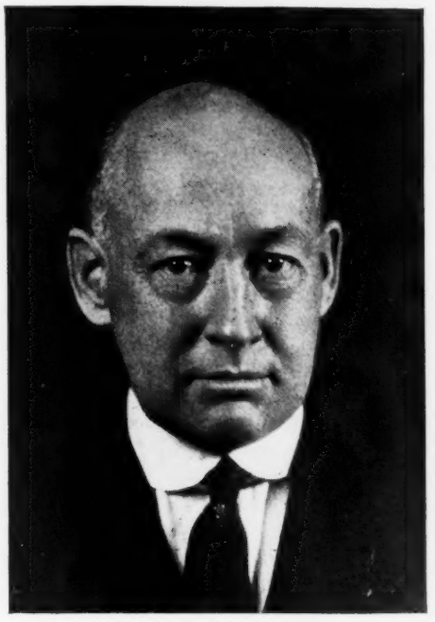
THE General Crushed Stone Co. at Akron, N. Y., has been making extensive alterations and additions to its plant equipment during the past winter that will enable it to meet the big daily demand for output of product. About $20,000 has been spent by the company in equipping the steam shovels with caterpillar tractors.

The company closed a contract last week with the New York Central for 20 carloads of ballast daily for the West Shore railroad and this is but one of the numerous big orders booked for this season's business.—*Akron, N. Y., Journal.*

Ready Mixed Concrete

[The methods committee of the American General Contractors' Association has reported as follows regarding mixed concrete. The subject is of interest to ROCK PRODUCTS readers as mixed concrete is one of the extensions proposed for the sand and gravel and crushed stone industries.—Ed.]

THE committee wishes to present as a timely topic the possibilities of improving methods of handling concrete by the establishment of central mixing plants. From the experience gained to date on highway work, central mixing plants have in many instances proven themselves practical and economical.



James Savage, appointed treasurer, succeeding John J. Sloan, elected president

Can we not perhaps go a step farther and establish central mixing plants in cities where material companies can deliver to general contractors specified mixed concrete?

Central plants can perhaps enable closer attention to proper mixtures by daily determination of voids, moisture content and time of mixing. Also through reduction in ton miles in delivery of mixed concrete as compared to raw materials, they can perhaps effect greater economy and less wastage. It will mean that the building contractors will have to think of handling concrete along other methods than those now commonly used, but by co-operation with the cement and lime industries, time of setting and consistency can perhaps be satisfactorily regulated. Several such urban plants are now in service in Little Rock, Tulsa and Los Angeles, and their operation may well be watched by all of us.

Outlook for the Construction Industry

By E. J. Brunner
Editor, American Contractor, Chicago, Ill.

A. P. GREENSFELDER prepared a wonderful paper on winter construction, which was among the other wonderful papers read to you people this afternoon, and I think that the executive committee should consider very carefully what Mr. Greensfelder said to you. He is carrying that same idea before the Association of General Contractors now meeting in Chicago, and they are trying to put through a plan for winter production. As was said in the report from Mr. Greensfelder, you people can unite hand in hand with the contractor in an effort to put winter construction on a practical basis.

I did not have time to prepare a manuscript, but I have some notes and I have some charts regarding the "Outlook for Construction During 1924." I had understood my talk to be on "Outlook for Building Construction," so most of my remarks will be shot at that target.

If men were like machines, so that we could figure the exact production, under set circumstances, and analyze the demand for building and the supply of materials and labor, we could then determine exactly what would happen in 1924, but men are not machines. Men are individualistic. When you tell the American business man a task can not be done, he is quite apt to put in motion the machinery for doing it very efficiently.

Maybe our ancestors are somewhat to blame for our determination to keep on in the face of difficulties. You know we had a certain ancestor called Noah. You had a little song last night about "Noah," I have thought quite a bit about that song and its subject. Did you ever stop to think that Noah was a promoter. If he had been living today some big oil company would have picked him off as their promoting agent. Oil has a way of attracting big men. Noah floated a big stock company when the world was in absolute liquidation. More than that, Noah was a builder. He built an ark and gathered unto it tenants, and that ark lasted through that world liquidation, perhaps better than some of the modern apartment houses will stand liquidation if general liquidation comes to this country.

Now, in considering what may happen in 1924, in building construction, perhaps the first question that we should think of is: Are we about built up in this country? I have given some thought to trying to find out whether we are about built up or not, and one of the best things I could find on it was a survey put out recently by the United States Association of Real Estate Boards: perhaps some of you are familiar with that survey. They investigated conditions in 241 cities of the United States, through their local boards, through men who make their business by selling and buying real estate. Here is just a little summary I have made of that report:

"The shortage of housing accomodations which was large in this country at the end of the war is disappearing. Indications from a number of cities shows plainly that an equilibrium between supply and demand has been reached. In the majority of cases where there is a shortage of housing accomodations, the shortage exists in single-family dwellings. As indicated before, only four cities report an over-building of single-family dwellings, and in one of these the over-building is in high class residences rather than in small single-family dwellings. The cost of building has doubtless forced many people who would prefer to purchase and live in their homes to go into apartments.

E. J. Brunner

Now, I have taken certain conclusions from that real estate report and I have drawn charts, and I want to prevail upon your generosity to show you what these charts mean.

This first chart is composed of two parts. It is compiled from 241 cities of the United States reporting. In October, 1922, in 44% of these cities residential rents were going down; 17% of them were remaining stationary, while about 33% were going up. In June, 1923, only 10% of those cities were rents going down. Almost 40% were stationary and a little over 50% were going up.

In October, 1923, 10% were going down, and 50% stationary. You see we are getting to that economic condition where rents are reaching their level.

This second part of the chart is the same analysis from 34 of the largest cities, in cities over 200,000 population. Take October, 1922, about 15% were going down, about 52% were sationary, and a little over 20% were going up. (Mr. Brunner approximated these figures while showing the chart to the audience).

In October, 1923, in these larger cities of the United States, only about 12% of the rents were going up, 75% stationary, and about 15% were going down. Now let us consider business rents. Here is October, 1922, 60% were going up, 32% were stationary and 8% were going down.

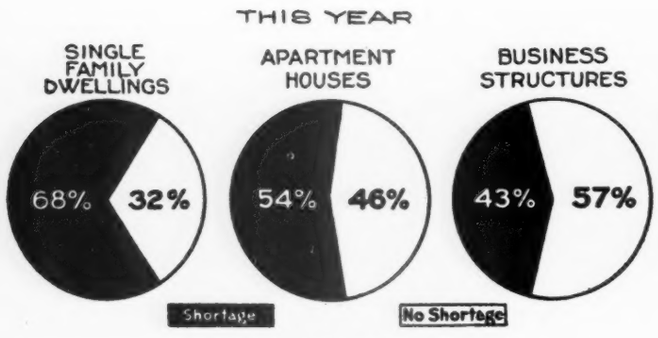
June, 1923, 30% stationary, and business rents still going up; about 73% still going up. For October, 1923, about 56% are still going up and about 40% stationary and about 6% going down.

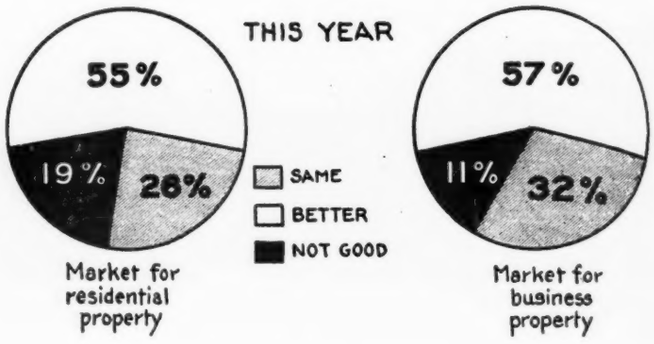
The mere fact that rents are becoming stabilized is shown in these reports from some of the largest cities. As to the percentage of houses, percentage of shortages of different types in these cities, the reports show:

You come from different cities, and you hear different things about the shortage of apartments. In Chicago you hear they are about built up on the high class apartments and have a shortage of the modest class apartments. We hear the same thing about New York.

Harry Beardsley, of the *Daily News* of Chicago, has gotten behind this shortage and this matter of being over-built in a little different way. Mr. Beardsley has discovered that, in Chicago, perhaps, we are over-built in some of the expensive aparment houses, but it is mostly on the two, three and four-room apartments; and when you get to the six-room apartments, we have not been building them, so we are not over-built.

Let us now see what we have actually been doing during the past year in building. Let us see just how much we have been doing. Here is the volume of construction in 27 states, as shown by the weekly contracts awarded by F. W. Dodge Corporation. I have analyzed their figures in the weekly average valuations, during the year of 1920. The weekly average valuation of contracts awarded in those 27 states, which lie north of the Ohio and east of the Missouri River, was $49,000,000. In 1921, it





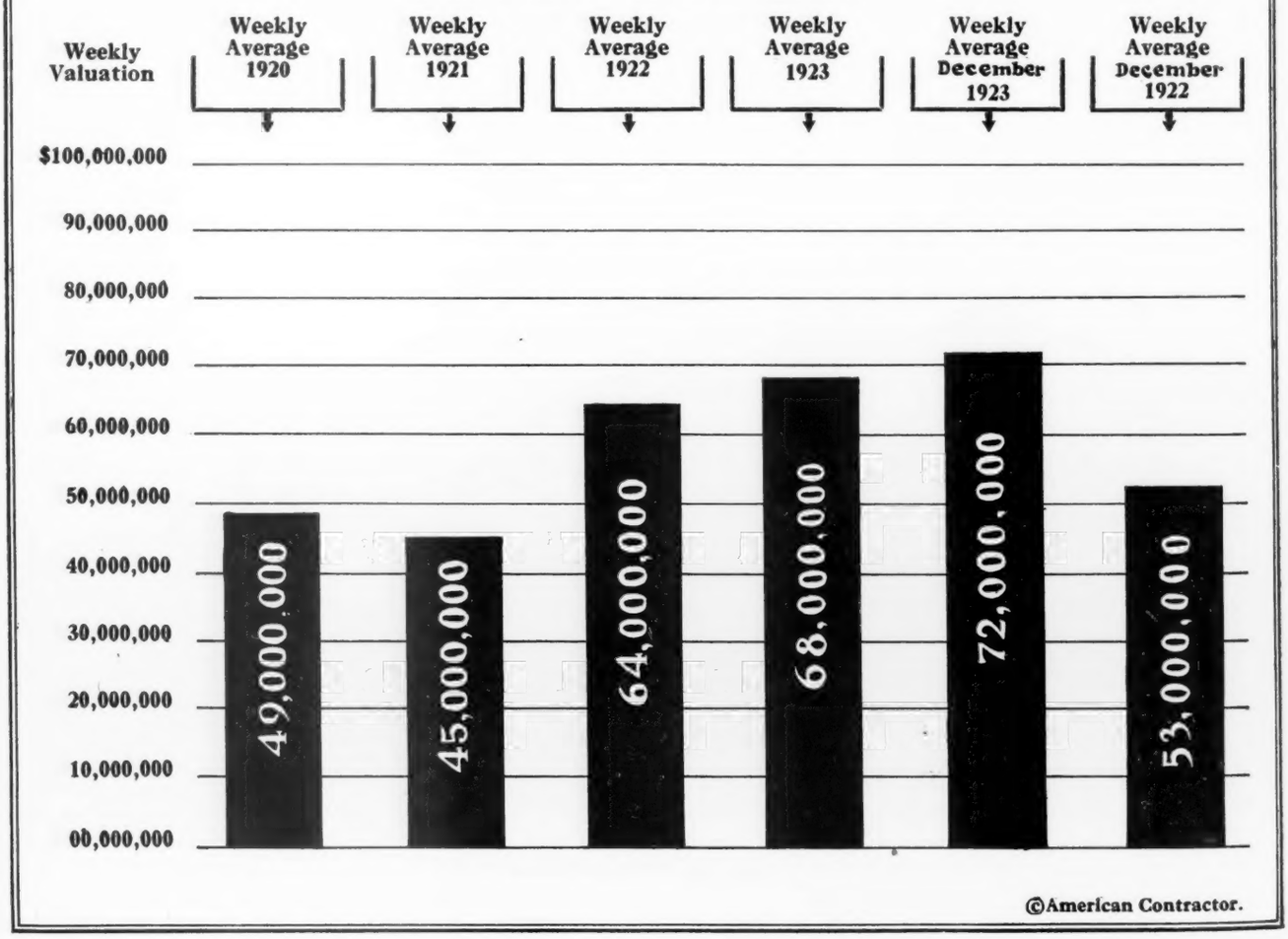
Section	—Pct. Reporting Shortage of— Single Family	Apartments	Business	—Money Market— Amount	Rate Most Common, Per cent
North Atlantic	70	50	18	Plenty	5½- 6
Central Eastern	53	47	30	Divided	6 - 7½
South Eastern	94	78	50	Plenty	7 - 9
South Central	29	22	22	Plenty	8 -10
Great Lakes	78	56	48	Plenty	6 - 7
North Central	60	33⅓	30	Plenty	7 - 8
Mountain States	44	36	41	Plenty	8
Pacific States	76	59	53	Plenty	7 - 8
Canada	23	13	....	Plenty	6½- 7

VOLUME OF CONSTRUCTION

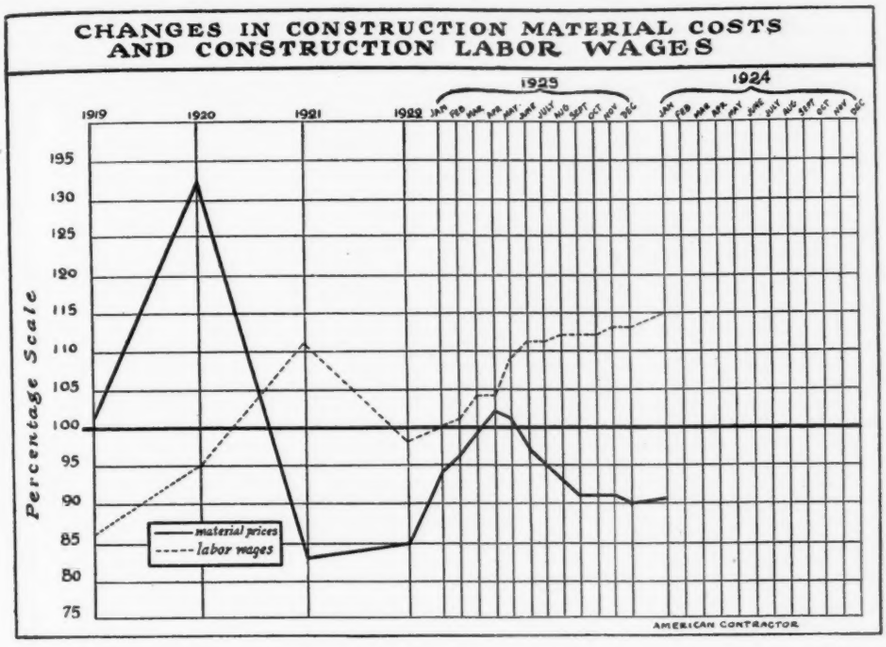
IN TWENTY-SEVEN STATES

As Shown by Weekly Contracts Awarded

Statistics From F. W. DODGE CORPORATION



was less,—it was $45,000,000. In 1922, $64,000,000, and you know that in 1922 we said that regardless of increases in construction costs over 1914, we were doing a big business. We had recovered from our slump during 1923,—we did still better, $67,000,000 every week. For December, 1923,—the last month, mind you, of 1923,— we went above the average for the whole year. Now, that is showing something of our start for next year. During December, 1923, it was $70,000,000, while during December 1922, which realy gave us the start for this last year, the weekly average was only $53,000,000.



[Mr. Brunner then exhibited a blank tabulation form and took a straw vote of those present as to the probability of more or less building than last year of single residences, apartments and flats, hotels, factories and warehouses, schools, churches, public buildings, public garages. The resultant vote was in the ratio of two to one favoring the opinion that 1924 would be as good or better than 1923 in the building of each of the classes mentioned. School building received almost a unanimous vote for more activity.]

I now want to say a word about costs. You have made your estimates of volume for the present year, with costs about where they are. We have seen that, whereas, we are more nearly built up than a year ago, there is still a great potential need for building.

Labor wages as shown on this chart are based on actual numbers of the various trades working in the different cities. Therefore it shows accurately what has taken place, and we see construction wages now at a peak. If wages in New York City rise still more, the effect will show pronouncedly on this chart when such rise occurs. On the other hand, if wages of bricklayers in Akron, Ohio, go up, the effect upon this line showing labor wages is not great, because the number of bricklayers in that city is comparatively small. I submit to you, gentlemen, that if we do as much building in 1924 as in 1923, we cannot expect wages to come down because the demand for men will be too great.

Material prices, as you see, have behaved very well during the last year, but the signs of spring activity are apt to make the general level climb rapidly.

The thing which will be most conducive to the best prosperity for 1924 will be a steady and not too large a volume of building. There can not come a slump without first having inflation, and there cannot come an inflation unless activity goes on at too great a pace.

Kansas-Oklahoma Cement Rate Reduced

IN orders released recently by the Oklahoma Corporation Commission, with the Interstate Commerce Commissoin, new rates on cement for interstate movement between Oklahoma and Kansas, and intrastate in Oklahoma are prescribed, which will reduce present rates from 10 to 15%. The orders are given in the case of the Iola Cement Mills Traffic Association, and others, vs. Arkansas Western Railway Co., and others.

The reduction in cement rates, as announced recently, will result in the saving of about $250,000 annually to Oklahoma users of cement. This industry has become one of the most important in the state. The future road building, aside from the usual lines of industry, in which cement is a vital factor, will no doubt be substantially affected by the announcement of the Corporation Commission.—*Dallas (Texas) News.*

International Cement

IN answer to a correspondent *Barron's,* a financial weekly published in Boston, gave the following:

International Cement Corp. is a youthful industrial company with plants in the United States, Cuba, Argentina, and Uruguay. The company has had a healthy expansion in business and earning power.

While net earnings in 1919 after charges amounted to but $1.33 per share of common stock outstanding, they had increased by 1922 to $4.06 per share after charges and preferred dividends on the common stock then outstanding. Last year was the best in the company's history and net earnings for the year are expected to approximate $6.20 per share on stock now outstanding.

Growth in earning power has been accompanied by a liberal dividend policy, disbursements on common stock having advanced from an annual rate of $1.25 in 1920 to a $4 rate in 1923.

Since its inception the company has expended more than $6,500,000 in the acquisition of new plants and in modernization and enlargement of old ones, this work being largely financed out of earnings. International Cement has also made an impressive record in building up its financial position, having current assets as of September 30, 1923, amounting to $5,217,611, as compared with current liabilities totaling $790,172, while in 1919 current assets were $3,049,996 and current liabilities $1,944,779. This represents an increase in working capital of $3,222,222, or slightly more than 300%. In addition, the capital structure of the company has been improved considerably, funded debt having been reduced from $2,176,583 to $352,000, a decrease of 84%. There is also outstanding $1,469,700 preferred stock and 364,167 shares of no par value common.

International Cement has of course benefited greatly from the building boom of recent years in the United States, deriving therefrom income which gives evidences of continuing for some time. Improved business conditions in the South American countries in which it produces indicate that better income may be expected from that territory in 1924. In view of the company's record, the common stock at current quotations around 43½ offers not only a satisfactory income (approximately 9.2%), but apparently a fair opportunity for future enhancement in value as well. At the same time International Cement is still a young company and its stock is not to be recommended for investment to other than the business man whose interests permit him to keep in fairly close touch with the affairs of this industry.

Alabama Gravel Rate Attacked

COMPLAINT against alleged excessive, unjust and unreasonable rates on gravel, carloads, from Cantelou's Spur to Evergreen, Ala., also petition for reparation, both directed against the Western Railway of Alabama and the L. & N. Railroad Co., has been filed with the Alabama Public Service Commission by the Good Roads Gravel Co. of Montgomery, Ala.

The Outlook for Municipal Construction

By W. W. Horner
Chief Engineer of Sewers and Paving, City of St. Louis

I RECENTLY heard an eminent divine who was installing a new pastor take his text from the words of Saul when he entered the city seeking Samuel, "Is the Seer here?" While listening to him, I though how many times in our daily business which trying to look a little into the future we turned for advice with that same question in our minds, and how very embarrasing it could sometimes be when the Seer did not have the spiritual guidance of the Prophet of old.

I feel very keenly my inability to offer a sound analysis of the municipal outlook for the coming year I know that one would naturally suppose that such stable and slow-going organizations as our municipalities would be easy to diagnose, but this is true only to a very limited extent. For example, I could tell you at this time that the city of St. Louis has authorized positively a million dollars in paving for 1924, but this is only a third of the volume of work which the city did last year, and there is on its books for 1924, more than the two million difference indicated; all at this time in an indeterminate condition.

In the absence of the spiritual guidance referred to, we are accustomed in these days to worship at the altar of statistics, but in the municipal field, even this aid is denied us. At this time no one can positively state what the municipal business was in 1923, and no very good figures will be available for at least three months. There is absolutely *no* compilation of any value as to the work of 1924 and there could not be, for all cities would have to answer an inquiry with the qualifications which I have just given with regard to the St. Louis paving work. They would be able to name a figure as assured, subject to increase of 100% to 300%. In the absence of this real information, we are forced to rely on impressions and on analysis of the general reaction of business conditions on municipal affairs. In the past three months, I have had the opportunity to discuss the municipal trend with more than a hundred city engineers and executives and I have found them far from unanimous in their conception of the years outlook. It must be borne in mind that the municipal official is always between two horns of the dilemma, which are the demand of the tax payers for more and better improvements, and the demand of the same body of people for reductions in taxation. The municipal administrations with their ears close to the ground, especially in the pre-election year, can appreciate closely the delicacy of balance between these extremes and their official positions are largely influenced by their interpretation of the relative strength of the two ideas. In one city, we find a dominant personality, guided by the idea that the people will remember the improvements long after the cost is forgotten; in another, a more conservative soul may prefer to stand before the electorate on a platform of expenses reduced.

There is no question that at this time costs of public works are at a high level and that the people generally appreciate that

W. W. Horner

work is expensive. I believe that there is no doubt that a continued increase in prices will bring a very definite reaction against public work. On the other hand, the cities are still far behind with their schedule of improvements and must go ahead as long as the people can stand the expense. Strong arguments for the reduction of public work have been presented in one or two cities where the matter has been brought to a head through the issuance of paving tax bills, closely approaching the assessed value of the property taxed. A few more instances of this kind will tend to crystallize public sentiment.

On the other hand, it must be remembered that the municipal programs are not decided upon in a minute; that they are only determined after numerous public meetings and the passage of legislation. For this reason there is always on the books of the municipality a considerable amount of work which is authorized and will generally go ahead regardless of eventualities. Municipalities also let work in large units, extending over a considerable period of time, and as a result, there is always a volume of business under contract which must be finished. These two factors tend to make the fluctuations in municipal work lag considerably behind the general changes of business conditions. These factors have permitted municipal work to go ahead in panic years to some extent, when all the peole were crying for a stoppage of expense. This same slowness of program development has also prevented the municipalities from putting large volumes of work on the market at times of low prices, and thus securing the benefit of prices and assisting to stabilize conditions.

With all of these factors taken into account, I have a feeling, not backed by concrete figures or exhibits, that the municipal business of 1924 will not show any radical change from that of the past year. I believe that there is likely to be a small reduction in the amount of municipal paving. The cities last year made a strenuous effort to catch up in this respect and as a result, most of them had the biggest paving year in their histories. In doing so, many old held-over projects were cleaned off the books and the year 1924 will be confined more exclusively to new business.

The two classes of municipal improvements which generally approach paving work in volume, that is, sewerage and water supply, should show some increase. The sewerage work of the cities had dropped almost as far behind the demand as had their paving progress and in the work of 1923, paving work was undoubtedly given the preference over sewer construction. Waterworks construction has almost invariably carried on with greater vision than other classes of municipal work and has also been the last of our municipal expenses to be reduced. Our water works have, therefore, been in better condition since the war than have our sewers or our pavements and have been able to wait for further extensions, where paving and sewerage could not be delayed. I think this period of waiting is about over and that the next year will see a decided increase in expenditures for water works proposed.

Projects are undoubtedly developing in considerable volume for such miscellaneous city functions as park improvements, institutional buildings, administrative buildings and lighting systems. In most instances, however, I should not expect a large increase of actual construction in these direc-

tions next year, so much as a development of programs to be carried out in the year following.

On the whole, I am not so much concerned about the work of 1924 as I am in regard to the effect which the work of that year may have on the year following. If we can get through another big years business in 1924 without any material increase in prices, I feel that public work may continue for some time on a slowly increasing basis, but if costs should be seriously increased this year, I feel quite sure that a reaction against public work will develop, which may give us leisure to take stock in 1925.

Aside from the outlook as to the volume of business, which is the question in which I am sure you are most interested, I believe we should give serious consideration to the question of improvement of the quality of the production. During the war and for a year or two thereafter, the engineers of the municipal departments have been most concerned with catching up and have been prepared to go ahead and get something done, even at some sacrifice to the standards of workmanship. During the past year I have noted particularly, the reaction which has come from our hurry-up construction and I find municipal men generally of the mind that the biggest rush is over and that they are disgusted with slip-shod improvements and should not be surprised to see specifications and standards for material and workmanship, considerably revised and tightened on the new work coming out.

Closing Remarks of the President

CHAIRMAN SLOAN: Is there any discussion on Mr. Horner's very worthy paper? That the peak of values has largely been reached and the excellence of product must be maintained are worthy things to bear in mind. What is the further pleasure of the house? Is there any unfinished business? If there is not, let the chair thank you for your courtesy, kindness and your attendance at this convention, and before we now adjourn I would like to have an expression of opinion from a number of gentlemen whether the convention should be held next year, this time, in the city of New Orleans. Let us have a viewpoint on it for the guidance of your executive committee and the board of directors.

Hermitage Portland Cement Plant Ready

IN a few days the Hermitage Portland Cement Co. plant will be in operation. The machinery is here complete and final adjustments of the splendid new equipment are being made. With its beginning Nashville will have an industry with a capacity of a million tons of cement a year, and it will be one of the important cement producing plants of the South.—*Nashville, Tenn., Banner.*

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Chalmers & Williams:
A. H. Coxhead, Chicago Heights, Ill.
Columbus-McKinnon Chain Co.:
D. Brisbin, O. H. Hager, Columbus, Ohio.
Leroy B. Donough, representing Fred A. Gill, Lebanon, Penn.
E. I. du Pont de Nemours & Co.:
W. E. Pratt, C. M. Smith, R. H. Summer, St. Louis, Mo.; H. H. Hamilton, Pittsburgh, Penn.; S. R. Russell, Wilmington, Del.; R. A. Sinclair, St. Louis, Mo.
Easton Car and Construction Co.:
C. B. English, W. E. Farrell, Easton, Penn.
Ensign-Bickford Co.:
J. K. Brandon, Simsbury, Conn.
Fate-Root-Heath Co.:
H. R. Sykes, Plymouth, Ohio.
Flexible Steel Lacing Co.:
Chas. J. Smith, Perry, Iowa.
Frog, Switch and Manufacturing Co.:
H. A. Johann, J. G. Johann, Chicago, Ill.
General Electric Co.:
J. E. N. Hume, C. T. McLaughlin, E. W. Pilgrim, H. S. Sherman, Schenectady, N. Y.
General Explosives Co.:
W. E. Blair, St. Louis, Mo.; E. W. Hawley, A. J. Shoemaker, Chicago, Ill.
Fred A. Gill, Lebanon, Penn.
Grasselli Powder Co:
M. S. Kincaid, John F. Munn, Chicago, Ill.; W. W. Phillips, Cleveland, Ohio.
George Haiss Manufacturing Co.:
W. H. Bosworth, Douglas Rolfe, New York City.
Hendrick Manufacturing Co.:
Bruce G. Shotton, Pittsburgh, Penn.
Hercules Powder Co.:
J. Barab, C. C. Gerow, N. S. Greensfelder, J. H. Horlick, Jr., E. I. La Beaume, W. S. Magill, Wilmington, Del.; N. J. Austin, P. R Carey, W. F. Gainty, Chicago, Ill.; F. W.

Hoyt, James R. Little, Chas. B. Spicer, St. Louis, Mo.; K. A. Browning, R. B. Scholls, Dallas, Texas; Wm. A. Anderson, Buffalo, N. Y.; C. W. Swanson, Pittsburgh, Penn.; L. R. Bailey, Little Rock, Ark.
Jeffrey Manufacturing Co.:
J. T. Fowler, G. C. Horst, Columbus, Ohio.
Kennedy-Van Saun Manufacturing and Engineering Corp.:
W. J. Cavanaugh, Wm. Jennings, New York.
Keystone Consolidated Publishing Co.:
E. B. Day, C. E. Harris, Pittsburgh, Penn.
Koehring Co.:
A. E. Holcomb, Paul F. Zimmerman, Milwaukee, Wis.; C. F. Rabbeitt, St. Louis, Mo.
Loomis Machine Co.:
C. C. Hale, J. Reynard, Tiffin, Ohio.
Marion Steam Shovel Co.:
Harvey T. Gracely, Arthur F. King, C. B. Watrous, E. R. Wilson, Marion, Ohio.
Morgan Engineering Co.:
A. T. Davis, Alliance, Ohio; E. E. Silk, Chicago, Ill.
New York Belting Co.:
R. F. King, C. C. Smith, St. Louis, Mo.
Northwest Engineering Co.:
W. M. Jones, St. Louis, Mo.
Osgood Co.:
Earle C. Smith, Marion, Ohio.
Pawling & Harnischfeger Co.:
Daniel J. Murphy, Dallas, Texas.
Pennsylvania Crusher Co.:
C. S. Darling, Chicago, Ill.
Pit and Quarry:
John J. Fitzgerald, F. G. Pulley, R. G. Symons, Chicago, Ill.
Quaker City Rubber Co.:
Chas. E. Giesson, St. Louis, Mo.
Robins Conveying Belt Co.:
Robert H. Braun, Los Angeles, Calif.; John F. Meissner, Chicago, Ill.; Thomas Robins, Jr., New York City.
Rock Products:
Charles A. Breskin, George M. Earnshaw, Nathan C. Rockwood, Edmund Shaw, Chicago, Ill.
Sanderson-Cyclone Drill Co.:
A. O. Crum, M. B. Garber, Orrville, Ohio.
Seaboard Air Line Railway:
P. A. Blair, Chas. A. McKeand, Savannah, Ga.
Shope Brick Co.:
W. A. Warner, Portland, Ore.
Smith Engineering Works:
S. A. MacIntosh, G. L. Moon, Milwaukee, Wis.
Taylor-Wharton Iron and Steel Co.:
C. B. Andrews, High Bridge, N. J.; Redington Moore, Chicago, Ill.
Traylor Engineering and Manufacturing Co.:
B. Haislip, W. C. MacDowall, Allentown, Penn.
Trojan Powder Co.:
O. B. Niesen, M. W. Withey, Allentown, Penn.
G. H. Williams Co.:
B. W. Hamilton, Carl F. Werblen, Erie, Penn.
Williams Patent Crusher and Pulverizer Co.:
Ray F. Schneider, St. Louis, Mo.
Worthington Pump and Machinery Corp.:
C. E. Brotherton, St. Louis, Mo.; Sheldon Stearns, New York City; J. S. Bond, Milwaukee, Wis.

GUESTS

American Steel and Wire Co.:
F. J. Oistrucher, St. Louis, Mo.
Anna Stone Co.:
Geo. H. Rippetoe, Anna, Ill.
H. H. Armstrong, Alton, Ill.
Mrs. Howard Baer, Toledo, Ohio.
K. Baumgarten, St. Louis, Mo.
Big Bend Quarry and Union Quarry Construction Co.:
Morris Skrainka, Ralph N. Skrainka, Louis Skrainka, Walter J. Skrainka, St. Louis, Mo.
Blaw-Knox Co.:
G. Schirmer, Chicago, Ill.
Blue Diamond Co. of Los Angeles:
K. M. Grier, Los Angeles, Calif.
Blue Diamond Process:
A. P. McCallie, New York City.
Mrs. Harry Brandon, Piqua, Ohio.
Broderick & Bascom Rope Co.:
Louis J. Kern, E. M. Stephanus, St. Louis, Mo.; F. L. Davis, Kansas City, Mo.
Edwin Brooker, Washington, D. C.
Browning Co.:
John J. Gerhard, Chicago, Ill.
Albert J. Bussen, Charles Bussen, Jefferson Barracks, Mo.
Charles Stone Co.:
W. C. Roberts, Marion, Ill.
Cincinnati Rubber Manufacturing Co.:
Geo. J. Dunn, Kansas City, Mo.
Clayton Quarry Co.:
Roy H. Rich, St. Louis, Mo.
Climax Engineering Co.:
T. L. Keeling, H. B. LaRue, Clinton, Iowa.
Coal Operators' Association:
P. H. Greenlaw, St. Louis, Mo.
Consumers Co.:
J. H. Sehwat, Chicago, Ill.
Davidson Granite Co.:
J. K. Davidson, Lithonia, Ga.
Denver Rock Drill Manufacturing Co.:
F. O. Withrow, St. Louis, Mo.
Des Moines Sand and Fuel Co.:
G. E. Gray, Des Moines, Iowa.
R. J. Dick Co., Inc.:
C. H. O'Bannon, St. Louis, Mo.
Lucien Duduay, St Louis, Mo.
East St. Louis Stone Co.:
A. C. Dodd, Ralph E. McLean, A. Mors, East St. Louis, Ill.
Equipment Corp. of America:
T. G. Davis, Chicago, Ill.
Equitable Powder Manufacturing Co.:
R. G. Chaney, East Alton, Ill.
Fehlig Construction Co.:
T. L. Fehlig, St. Louis, Mo.
Good Roads Machinery Co.:
M. A. King, Chicago, Ill.
Government of Dominican Republic:
J. H. Cook, New York City.
Hamilton Washed Sand and Gravel Co.:
J. W. Outhier, Hamilton, Ill.
Earl C. Harsh, Cleveland, Ohio.
Hayward Co.:
H. M. Davison, New York City.
Hughes Stone Co.:
W. A. Moore, Tulsa, Okla.
Robert W. Hunt Co.:
D. B. Rush, Chicago, Ill.
William Chapin Huntington, Chicago, Ill.
Illinois Geological Survey:
M. M. Leighton, Urbana, Ill.
Illinois Powder Manufacturing Co.:
A. H. Bassler, St. Louis, Mo.
Illinois State Highway Department:
G. E. Rynearson, East St. Louis, Ill.
Indiana Quarries Co.:
H. R. Blackwell, St. Louis, Mo.
Mrs. Harry A. Johnston, Piqua, Ohio.
Frank Kane, St. Louis, Mo.
Kentucky River Stone and Sand Co.:
R. B. Ripy, Lawrenceburg, Ky.
Kiggins Quarry Products Co.:
M. T. Kiggins, Litchfield, Ill.
Theo. Krueger, St. Louis, Mo.
Landers Morrison Christenson:
C. H. Young, Minneapolis, Minn.
Lehigh Lime Co.:
J. F. Rhodes, Mitchell, Ind.
A. Leschen & Sons Rope Co.:
Wm. Wagener, St. Louis, Mo.
Lutz Stone Co.:
R. L. Lutz, Oshkosh, Wis.
Thos. J. Mulgrew, Dubuque, Iowa.
Ohio Hydrate and Supply Co.:
E G. Baker, Woodville, Ohio.
Ohio Locomotive Crane Co.:
C. S. Rogers, Bucyrus, Ohio; J. O. Rudd, Chicago, Ill.
Mrs. F. R. Patterson, Findlay, Ohio.
A. C. Pickelhemier, Cincinnati, Ohio.
Portland Cement Association:
A. J. R. Curtis, Chicago, Ill.
Quarry Products Co.:
R. L. Dudley, John T. Woodruff, Springfield, Mo.
Robbins Young Co.:
Chas. H. Young, Minneapolis, Minn.
Rock Hill Crushed Stone Co.:
W. L. Connell, St. Louis, Mo.
J. L. Shiely Co.:
J. L. Shiely, St. Paul, Minn.
Sporto Lime Stone Quarry:
C. W. Bevington, Ellis Grove, Ill.
Stephens-Adamson Manufacturing Co.:
L. V. Lindquist, Aurora, Ill.
Superior Stone Co.:
R. J. Dalton, Thos. Madden, Chicago, Ill.
E. B. Taylor, Greencastle, Ind.
J. R. Thoenen, Sault Ste. Marie, Mich.
Tidewater Portland Cement Co.:
E. B. Nichols, Union Bridge, Md.
Union Electric Light and Power Co.:
W. L. Berry, St. Louis, Mo.
Universal Crusher Co.:
E. A. Velde, Cedar Rapids, Iowa.
Webb City & Cartersville Foundry Co.:
F. W. Sansom, Webb City, Mo.
Weldon Springs Quarry Co.:
Chas. Garcia, St. Louis, Mo.; J. J. Helfer, Wm. H. Recheirn, Weldon Springs, Mo.
White Co.:
G. W. Kneisly, Cleveland, Ohio.
S. I. White Stone Co.:
J. A. Moore, Kansas City, Mo.
Whitehouse Stone Co.:
E. E. Evans, Toledo, Ohio.
Mrs. Arthur R. Wilson, Watsonville, Calif.
James R. Withrow, Columbus, Ohio.

On Next Convention

MR. GRAVES: Mr. President, it is perfectly apparent that the applause which greeted President Sloan's comments as to the method and manner of holding next year's meeting was given with heart-spoken approval. It, nevertheless, seems to me that we must not be unmindful of the fact that each year our programs become better and better, and that is merely a process of evolution—progress—and no one, perhaps, has been more responsible for that than Mr. Rockwood, during the last two years. He had done difficult work and done it well. He has worked along lines contemplated. He has been in close touch with his Board of Directors. We know that it has been a labor of love, and we know that it has no profit in it for him. It would seem to me most fitting at this time that we move a vote of thanks to Mr. Rockwood for what he has done, and that we should, by formal resolution, show our very, real appreciation of the work that he has done for us.

CHAIRMAN GREENSFELDER of the Manufacturers' Division: I would like to add my appreciation to the work Mr. Rockwood has done. To him belongs the greatest part of the credit, and I would say that he is directly responsible for making the Manufacturers' Division what it is. I heartily second Mr. Graves' motion.

(A rising vote of thanks was extended to Mr. Rockwood).

Knoxville Will Try to Hold Gravel Rates

KNOXVILLE Traffic Bureau will attempt to hold for the city the present freight rates on sand and gravel at a hearing called in Nashville by the Tennessee Public Utilities Commission.

Manager Charles R. Moffett of the bureau was notified yesterday of the date of the hearing and stated that it was a matter of the utmost importance to the Knoxville sand and gravel plants at points along the Tennessee river.

"When competitive bids for furnishing sand or gravel for building purposes and concrete highway construction often hinge on the item of a cent's difference in cost a ton, this application by the Southern Railway to increase freight rates on an average of 25 cents a ton means something," Mr. Moffett said.

Mr. Moffett stated that the increase was granted six months ago, but on application of the Knoxville Traffic Bureau the new tariffc were suspended during an investigation. He explains that the proposed increase, if put into effect, will make it impossible for Knoxville sand and gravel companies to furnish material further than 40 or 50 miles away since the increase will prevent competition with local concerns.—*Knoxville, Tenn., Tribune.*

Indiana Gravel Company Building Big "Digger Boat"

WHAT is said to be the largest gravel digger ever constructed in this part of the country is now being built at the yards of the Evansville Wyas Co., Evansville, Ind., for the Bedford-Nugent Sand and Gravel Co. The digger will be 125 ft. long with 30-ft. beam. Last year the Wyas Co. reported building two large gravel diggers, a derrick boat, and five barges for river trade. —*Evansville (Ind.) News.*

Exhibits of the Manufacturers' Division of the National Crushed Stone Association

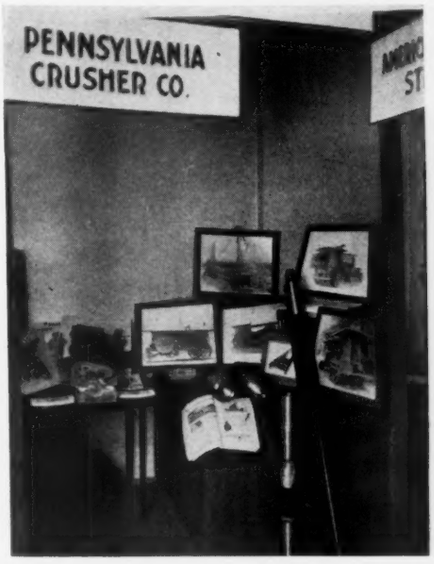
WITHOUT doubt the exposition of model machinery and equipment held in connection with the seventh annual convention of the National Crushed Stone Association at St. Louis, Mo., January 21-23, 1924, was the most complete and instructive show of its kind ever staged anywhere. It proved conclusively the value of small working models to demonstrate mechanical principles and sales features, and it proved that it is possible to hold such exhibits of the heaviest and most rugged types of machinery used in industry within the space of a hotel banquet room. Of course, such exhibits as this can never take the place of exhibitions like the Good Roads Show in the Coliseum at Chicago, or the Mining Show at Milwaukee; yet these are tremendously expensive ventures for the manufacturers of machinery and equipment, and while thousands of pepole may visit them out of curiosity, only a few hundred are prospective purchasers. In the case of the St. Louis exhibition of models the actual expense of exhibit space was only $10 per exhibitor; and while the attendance was only about 250 quarrymen—every one of these visitors was a live prospect.

So successful and interesting was the exhibit from the point of view of the rock products producer that the National Sand and Gravel Association in session at the same time in St. Louis adopted a resolution to invite equipment manufacturers to organize a similar exhibit for the next annual convention of the National Sand and Gravel Association.

From the point of view of the manufacturer of machinery and equipment, as expressed by their representatives in St. Louis, there was every reason to consider the show an unqualified success; and it was expected that this demonstration will lead to still greater efforts to make use of models, and of ordinary hotel facilities for exhibiting them, at conventions yet to come.

The views herewith show practically all the booths and exhibits except the booth jointly occupied by the Traylor Engineering and Manufacturing Co., and Rock Products, and the model gearless crusher of the Kennedy-Van Saun Manufacturing and Engineering Corp. (incidentally one of the best exhibits), which were inadvertently overlooked by the convention photographer, or his plates did not come out. Rock Products displayed panels of plaster made from unburned ground limestone by the Willard process and these attracted considerable interest.

Working models of machinery exhibited included a complete crushing and screening plant, two hammer-mill crushers, two well drills, one drill-sharpening machine; drill points; a roller grizzly, a shaker screen, a crane and clamshell bucket; belt carrier; belt fasteners; drop-bar grizzly and crusher; screen plates; quarry cars; gasoline shovel; manganese-steel machine parts; blasting equipment; two gearless gyratory crushing units.

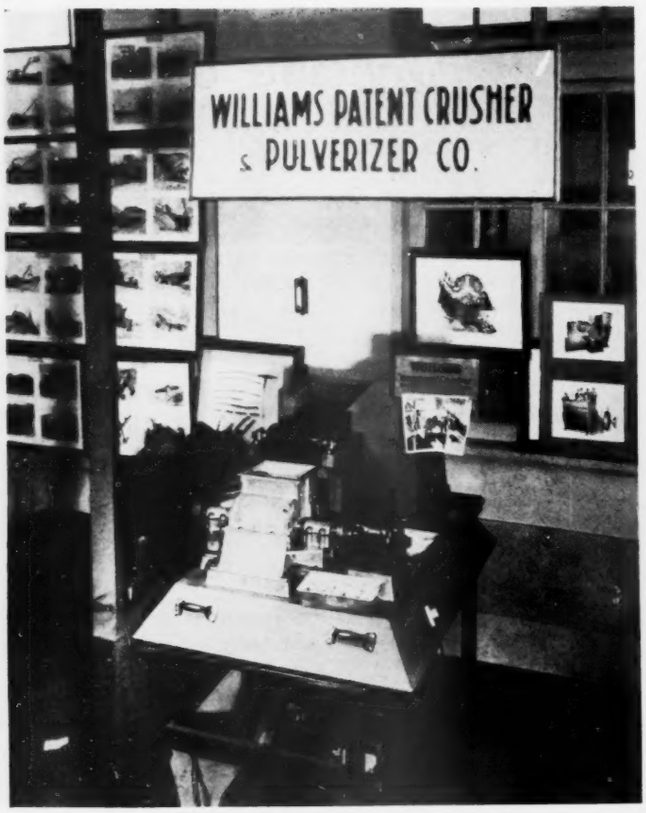


Model hammer mill of the Pennsylvania Crusher Co., and drill points of the Loomis Machine Co.

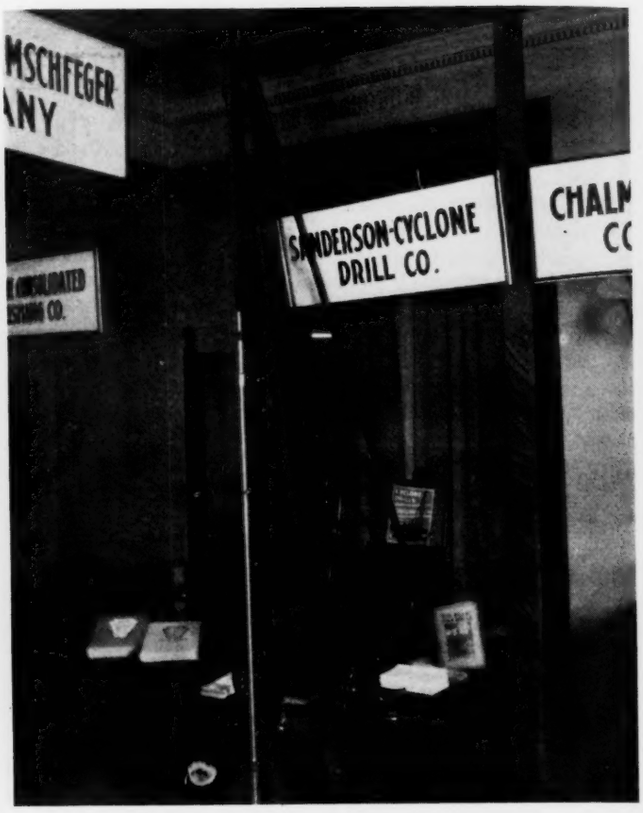
Other booths were used as headquarters for literature, blueprints of machinery and plants, etc. The only difficulty met with in the exhibit was the fact that it sometimes proved more interesting to many quarrymen than the sessions of the convention; and it was necessary at times to take desperate measures to clear the exhibit hall in order to get attendance at the sessions.

Besides the exhibits illustrated there was a moving picture show on one evening of the convention, during which films were shown illustrating steam shovels with the latest capterpillar traction in operation, cranes, mortar-mixing machinery, etc. The moving pictures were followed by a smoker and "girl show," which insured a full attendance—in fact, the best attendance of any session of the convention! Not shown in the pictures of exhibits herewith was a booth erected in the meeting hall proper by the Seaboard Air Line Ry.—the newest associate member—with maps of deposits and samples of rock awaiting development on its lines—a feature of the convention which may be developed at future meetings with profit to all. Several members of the Manufacturers' Division also had places on the program of the convention and their papers are printed elsewhere in this issue.

Hercules Powder Co. exhibit in the foreground; Columbus-McKinnon steam-shovel chain links; complete model crushing and screening plant of the Smith Engineering Works

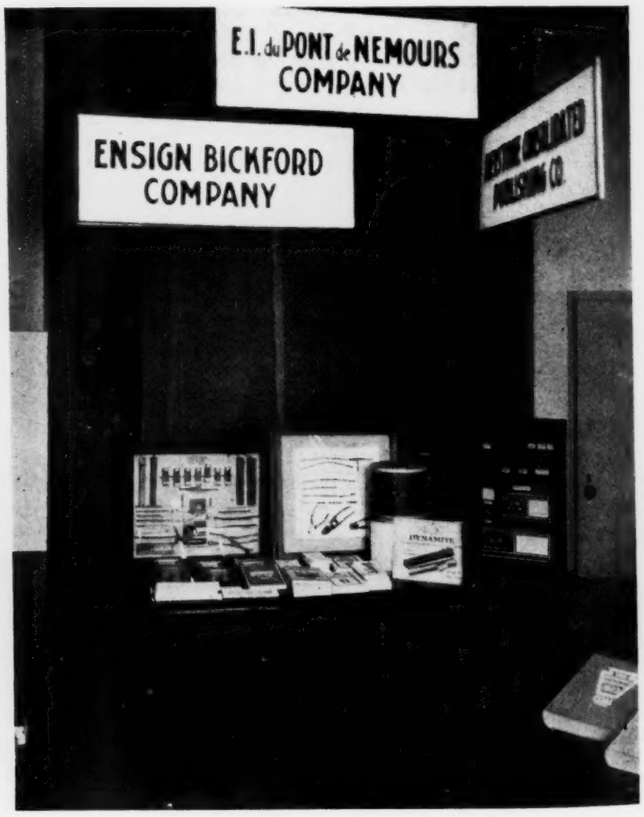


Model feeder and hammer mill of the Williams Patent Crusher and Pulverizer Co.; at the left Osgood Co. exhibit of photographs of machinery in action



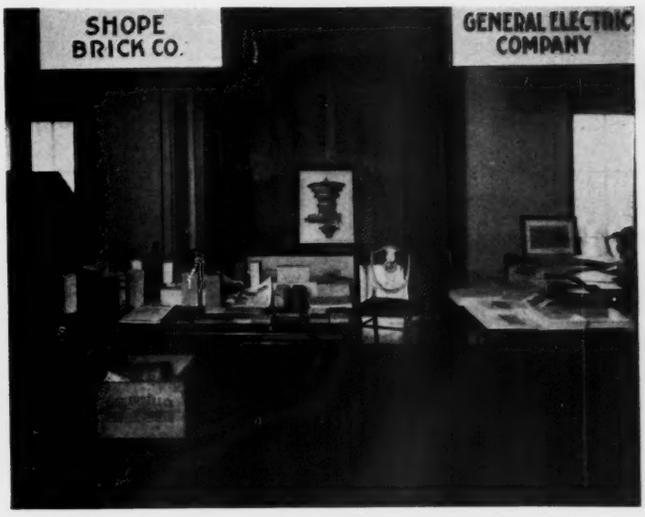
Model well drill—Sanderson-Cyclone Drill Co.; at the extreme left in the center aisle was a moving picture exhibit of the Pawling and Harnischfeger Co.

Center aisle showing model drill and drill-sharpening machine of the Armstrong Manufacturing Co.



Booths of Ensign-Bickford Co., E. I. du Pont de Nemours and Co., and the Keystone Consolidated Publishing Co.

Austin Manufacturing Co., Atlas Powder Co., Jeffrey Manufacturing Co., New York Belting and Packing Co. booths



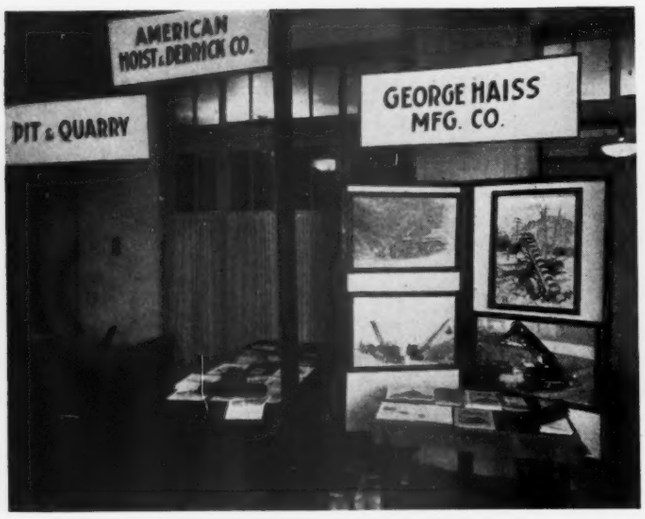
Concrete face brick exhibit of the Shope Brick Co. and General Electric Co. literature

Exhibit of the Robins Conveying Belt Co.—model grizzly and shaking screen

Good use made of two booths for literature, photographs and blueprints

Model crane and clamshell bucket exhibit of the G. H. Williams Co. and literature layout of the Allis-Chalmers Manufacturing Co.

More use of exhibit space for photographs and literature—model crusher at right is shown better in another view on preceding page

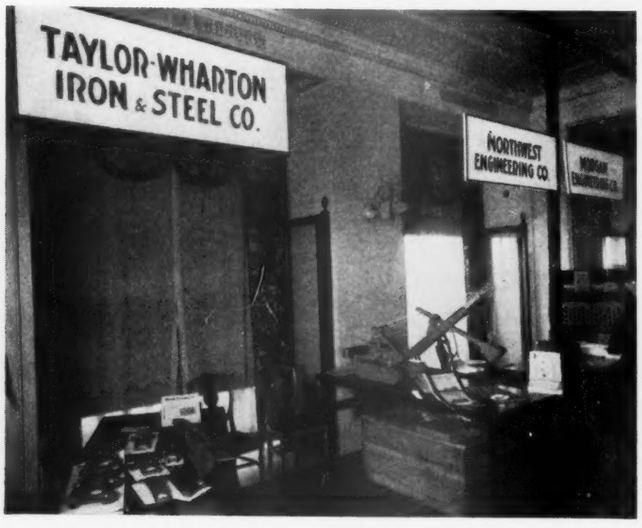


Photographs of equipment in operation made attractive exhibit of George Haiss Manufacturing Co.

Gill drill bits, Easton model quarry cars and photographs of Plymouth gasoline locomotives made quarry group

Model Morgan crusher and Hendrick Manufacturing Co. exhibit of screen plates

Quaker City Rubber Co. and Flexible Steel Lacing Co. exhibits of belts and joints



Manganese-steel machine parts of the Taylor-Wharton Iron and Steel Co. and model of gasoline shovel by Northwest Engineering Co.

Model crusher and drop-bar grizzly exhibit of the Chalmers and Williams Co., Koehring Co. booth on the right—All models were operated by electric motors

TRANSACTIONS

of the

Eighth Annual Convention

of the

National Sand and Gravel Association

Held at St. Louis, Mo.
January 22 and 23, 1923

Prepared from the Official Stenographic Report
of the Convention

Transactions of the National Sand Gravel Association, Eighth Annual Convention

St. Louis, January 22, 23, 1924

Mayor Kiel's Address of Welcome

[The convention was opened by President Alex W. Dann, who introduced Mayor Henry W. Kiel of St. Louis, who spoke as follows:]

MEMBERS of the National Sand and Gravel Association: I have come here, as the chief executive of the city of St. Louis, to extend to you a welcome to St. Louis. You have not made a mistake in coming to St. Louis to hold your meeting, because St. Louis is a good city. We have proven it is a good city, we boast of its progressiveness and its good citizenship, and to have you come here and accept of our hospitality is indeed a pleasure to us.

I am somewhat familiar with the industry in which you are engaged; that is, I have used quite a good deal of sand in my life, to keep myself from "slipping" and for other purposes. I remember the time, years ago, when you were not of nearly as much consequence as you are today. On account of the advance that has been made in all lines of industry, gravel and sand have become a great necessity. The art of road building and reinforced concrete construction has created a great demand for your material, and, while it seems an easy thing to go in and deliver (to drop some dredges and pump sand upon a levee or into a barge, or go out into some little creek and gather gravel) nevertheless it requires time and attention and a great deal of devotion to the business, in order to give to the public what the public requires.

For that reason, when you come together, as you do this morning, and exchange thoughts and ideas, with a view of helping conditions, making them better in every way, your time is well spent, and I want to commend you and congratulate you for being here on an occasion of this kind.

Early Days in the Sand Business

You know, the conditions of this nation, in fact, the conditions of the whole world, have changed in the last 20 years. I remember 25 or possibly 30, or maybe a few years longer ago than that, "sand men"—as we called them then—were not a unit. I remember when sand was exclusively pumped from the Mississippi river; everyone had a barge and a "digger," as they called it, and they were in competition with each other. There were four or five sand companies then and it was a case of the survival of the fittest. The one who could sell the cheapest had the greatest amount of business. I remember when they sold sand at 5 cents a load; then the competition became so keen that one of the sand companies gave the sand away in addition to a glass of beer to the driver. (Laughter.) I remember that because I was on the barge when they were giving the beer away. (Laughter.)

Alex W. Dann (Keystone Sand and Supply Co.), Retiring President and Chairman of the Convention

The Days of Foolish Competition in Business

That was rivalry; that was business competition that ruined, and it was just such a condition as that that brought these men to realize they were fools. You know, a man can be a fool in business just as well as in anything else, and we had a lot of them at that time. That competition was not confined to the sand men or the cement men. If we had to have a few barrels of portland cement, we would pay $7 or $8 a barrel to bring it over here from Germany. We had some domestic cement that some people said was not any better than lime and water. That competition extended to the bricklayers. I was a bricklayer at the time and am now. That competition extended to all the different branches and it resulted in ruining practically all business.

You could not get a group of men like you together to discuss things that were to their interest, because they were jealous of each other. The idea was to get the business; it did not make any difference how much money was left, just so you got the business. I am glad to see, in these progressive times, that men not alone representing capital but men representing labor realize that they must exchange ideas, that they must meet, they must absorb knowledge from each other and give each other the benefit of their knowledge. That is what this nation is coming to, and it is the salvation of this nation. You are interested in your own product, you want to see it used, and yet you want to see it used to advantage to those who need it.

Advance of Concrete

Reinforced concrete today has made some wonderful strides. It is not more than 30 years ago that the first reinforced concrete building was erected in St. Louis, and everybody said it would not be possible to make something that would replace steel construction, yet it was done and today they are building of your material—your sand and gravel with the cement added—structures that go up into the atmosphere 15 and 18 stories. It is remarkable that that progress has been made and, for that reason, it is necessary that you produce the kind of material that will make for good work.

Now, in your lines, sometimes we do get dirty gravel. I know many a time a load of loamy sand was delivered that sometimes spoiled the work. Those things are the work of unscrupulous men in your business, and you should weed them out. When a man in your business does not give 100% in quality, he is doing you an injury, because a failure in any of these structures, due to unsuitable material, would put your product practically out of the market. I know in some years gone by where there was not as much caution in reinforced concrete construction, there were some failures, some instances where floors fell, where columns buckled and that was a sad blow to your particular industry. While you did not do the work, you provided the material, and where a defect does occur the responsibility has to be borne by every one in that particular line of business.

You are indeed welcome. I hope and know your stay will be a pleasant one. I know you will derive much benefit from this meeting, and I want you to go away pleased with having come to St. Louis, and if you will just sing our praises a little bit when you go back home, we will be everlastingly grateful to all of you.

President Dann's Address

IT is entirely proper that your officers, upon an occasion of this kind, should render a report of their stewardship and tell you what they have done for you during the past year and outline for the coming year a program of activities; activities for the advancement of the association and for the advancement, consequently, of the industry.

Condition of the Association Was Never Better

It is very gratifying to report to you at this time that our financial condition now is better than it has been at any time in the history of the organization. Mr. Prince, our secretary-treasurer, will report in a few minutes at greater length upon that, but I want to dwell upon it a little bit myself, and say that the association is growing in membership, constantly, and, consequently, it is growing in financial support given it. We can see for the future a prospect of steady advancement of this association, we can see a wonderful field of things which this association can do for the benefit of the industry and, therefore, for the benefit of each individual producer.

I was very much interested in the remarks of his honor, the mayor, relative to his advocating of good materials, because that is just exactly what he was doing, he was talking for quality of production, and he remarked on the fact that the furnishing of poor material on any one job was not alone a blow to the owner of the structure but it was a blow to the industry in general.

We sometimes used to feel, you know, that if one sand and gravel producer in a community furnished an inferior grade of material for a structure and that structure got into difficulties, that the odium was attached only to that producer who furnished the material, but we are commencing to learn and learn very forciby that such is not the case. We find that the material, sand and gravel, is judged as a whole as regards its desirability and availability for use in the various concrete structures.

Producers Raising Standard of Their Product

I think that is one of the things which we have brought out this past year more than at any other time in our history. We have tried to carry on propaganda and development work, looking toward the increase and betterment and quality of the material furnished by the producers generally around the United States. It is very gratifying to report that the producers in general, even those who used to think that they could get by with almost any old stuff, are commencing to see that it is for their own best selfish interests, and it is a good investment to invest money and time looking toward the improvement of their material.

Now, the executive secretary has written a very able report covering the activities of the association for the past year; he has gone into much detail on the work which has been carried on, and I suggest to all of you, if you have not already done so, that you carefully read this report and see what your association has been doing, what it is proposed to do and what has been done with the money which you have paid in as dues.

Appreciation of Good Car Service

There is just one point about the transportation problem, which I wish to touch upon: We have always felt that the sand and gravel industry, as a whole, is very much abused in the matter of car supply, and it has been. We have always been very ready to go to the railroads and object to the way in which we have been supplied cars in times past; we have gone freely to the Interstate Commerce Commission and to the American Railroad Association, and all the powers which have to do with the governing of car supply, and we have objected to them, forcefully and at length, explaining that we were possibly discriminated against. We have also objected very strenuously to priority, we have objected to priorities in principle and in practice. We have objected, of course, to the coal people getting cars when we have none.

John Prince (Stewart Sand Co.), Newly Elected President and Retiring Secretary-Treasurer

During the past year, we have had very little occasion to object to about car supply. We have had, as you know, no priorities; we hope sincerely me may never have them again, and, in this convention, I think it is due to the railroads, upon our part to thoroughly commend and congratulate them upon the showing which they have made during the past year, in that there has been no marked and general car shortage, that our industry in general has been supplied with cars. We have always been objecting; now I think, it is very apt upon our part to congratulate them upon the improved conditions. It is really a wonderful showing which they have made this past year, and they have demonstrated, we believe, what they can do, even with impaired facilities, if they put their shoulders to the wheel and co-operate and, best of all, avoid priority orders.

We will now listen to the report of Mr. John Prince, our secretary-treasurer, on the financial condition of the association.

Report of the Secretary-Treasurer

MR. JOHN PRINCE: Mr. President and gentlemen: While they are passing around the reports which have been prepared, I might call attention to what your president said, the fact that the low ebb of the association occurred about 18 months ago. During that year we had assumed a rather large obligation, on account of the freight rate situation. On top of that, the general prices in 1920 created a condition which disorganized this association and resulted in the withdrawing of large groups of members from this association, as groups.

Of course, many of the individual members of those state associations came back gradually, but for a time, particularly the year before this, we were in difficult circumstances, not knowing where our money was coming from and already having committed ourselves to rather large expeditures.

We have gotten through that period. Our membership is not as large as it was two years ago, but it is growing and the members we have are real members. I have had much less difficulty this year in making collections from those who are members. We had very few withdrawals, none of any consequence, and while there are still a good many producers and some of them large producers who are not members of the association, we believe they will become such.

We have received, so far this year, some 33 tonnage reports, which is pretty good considering that many books have not been closed. There is an encouraging feature of the reports received so far, in that of 31 companies reporting over this year and last, we show a tonnage of 4,400,000 tons this year. They showed a corresponding tonnage for last year of 3,100,000 tons, an increase of 1,300,000 tons, or about 36%.

The year has been one of extreme economy. Mr. Barrows has performed a remarkable feat in the cost of operating the association. I think it would be neither desirable nor wise to have to repeat that another year, and I hope very sincerely that the association will have added funds to operate on during the coming year. [Mr. Prince concluded his remarks by reading from the financial report and discussing the various items.—Ed.]

Report of Cost Accounting Committee

CHAIRMAN DANN: Mr. Haddow, as chairman of the cost accounting committee, has worked up an outline of cost accounting, which he now proposes to discuss with you, present to the association.

There was instituted, a few years ago, an inquiry on the part of a great many members for a cost system. It was proposed that the National Association should outline some sort of a cost system, which could be adapted to local conditions, so that it would be an encouragement to each producer to keep some sort of costs.

It will be found that more and more of the producers are keeping costs. You will find, of course, that some of the producers here, today, have elaborate and complete and very satisfactory cost systems. You will find, on the other hand, that many producers have no system of costs. Until very recently at least, such friends of ours as "depletion" and "depreciation" were not known in the gravel vocabulary. As a result, it was found that nearly every community had a producer, large or small, who knew practically nothing about his costs, except perhaps a very crude guess which he made at the end of the year, on account of the fact that he had a little more money in the bank or a little less than he had anticipated.

That will, of course, sound very strange to some producers who have followed, from the very beginning of their company, some sort of cost system, but I have, personally, known of producers who kept no cost accounts and had only a hazy idea of what it cost to produce what they sold.

MR. HUGH HADDOW: Mr. President and gentlemen: I do not really think it is necessary to discuss this report. We have simply devised this form, which we think includes about everything that can be included in this matter. These forms have been printed or mimeographed and are in the hands of the secretary, and we suggest that you obtain not only one copy and look these forms over, but if there is anything you do not understand, we will be very glad to enlighten you in any way we can. The secretary is willing and ready to supply these forms in any number, to any member of the association, and we would strongly urge that this form be used and followed out.

There may be some producers who have more elaborate systems of accounting, but we think this form covers the ground very thoroughly and I know if you take account of all these items on this form, put the cost down accordingly, when it comes to the end of the year you will know you have charged out everything that could be charged, and you will know your results are absolutely correct.

I do not think that most of you have seen this form, therefore, you are not able to ask any questions.

OPERATING REPORT AND TONNAGE COSTS

Month of.....192.....and Totals to.....192.....

.....SAND AND GRAVEL COMPANY

	PRESENT MONTH Amount	PRESENT MONTH Per Ton	TOTALS TO DATE Amount	TOTALS TO DATE Per Ton
1 SALES—Before Deductions:				
(a) Retail (Bank, Yard or Pit)				
(b) Wholesale (Car Loads)				
Total Gross Sales				
Less: (a) Allowances & Discounts				
" (b) Freight Prepaid				
" (c) Cost of Material Purchased for Resale				
Total Deductions				
NET SALES				
2 PLANT OPERATING EXPENSES:				
(a) LABOR:				
(a) Superintendence				
(b) Stripping				
(c) Excavating & Conveying				
(d) Washing & Screening				
(e) Loading on Cars				
(f) Other Plant Labor				
Total Labor				
(b) FUEL:				
(a) Coal				
(b) Electricity				
(c) Fuel Oil				
Total Fuel				
(c) SUPPLIES & REPAIRS				
(d) RESERVE FOR PLANT DEPRECIATION, Equipment & Buildings				
(e) RESERVE FOR DEPLETION OF DEPOSIT				
(f) SUNDRY PLANT EXPENSES:				
(a) Royalty—State or Individuals				
(b) Insurance				
(c) Rentals & Leaseholds				
(d) Reserve for Taxes—City, State, County				
(e) Switching & Demurrage				
(f) Patching Cars				
(g) Retail Yard Expense				
(h) Miscellaneous				
Total Sundry Plant Expenses				
3 TOTAL OPERATING EXPENSES				
4 OPERATING GAIN OR LOSS				
5 OVERHEAD EXPENSES:				
(a) Salaries				
(a) Officers				
(b) Office				
(c) Salesmen				
Total Salaries				
(b) Office Expense:				
(a) Office Rent				
(b) Light & Heat				
(c) Stationery & Printing				
(d) Office Supplies				
(e) Postage				
(f) Telephone & Telegraph				
(g) Miscellaneous				
Total Office Expense				
(c) Commissions				
(d) Advertising				
(e) Dues & Subscriptions				
(f) Automobile Expense				
(g) Reserve for Automobile Depreciation				
(h) Reserve for Furniture & Fixtures Depreciation				
(i) Traveling Expenses				
(j) Interest on Borrowed Money				
(k) Reserve for Federal Taxes				
(l) Miscellaneous				
Total Overhead Expenses				
6 TOTAL COSTS				
7 NET GAIN OR LOSS				
8 STATISTICAL:				
(a) Tons Sold Retail				
(b) Tons Sold Wholesale				
Total Tons Sold				
(c) Number of Cars Loaded				
(d) Number of Days Worked				

Form of Cost Accounting Sheet

Heard at the Convention

MRS. SHIELY tells a good story on herself. During a recent visit to New York while standing with Mr. Shiely on Seventh avenue, a woman asked to be directed to a certain place. In her kindly interest, Mrs. Shiely carefully and slowly described the route to be followed. The woman, of very much foreign birth, failed to grasp the simple instructions and in a tone of utter disgust exclaimed: "Vy don't you speeka da Ingleesh?"—*National Sand and Gravel Bulletin.*

Depletion, Depreciation and Income Tax Problems

By Fergus Mead
Of the American Appraisal Co., Milwaukee

THERE are really two ways in which we can approach any discussion of income tax problems. We might go at it from the standpoint of outlining it from the tax sense, i.e.: from the standpoint of all the regulations and passages of law controlling the preparation of income tax returns. That makes a very long story and not altogether an interesting story. It is detailed and technical. The other way is to approach the income tax problem as being in reality a problem of proper, effective and accurate accounting of business and the property used by business.

Just a few days ago I was ploughing through the new so-called Administration Tax Law—the Revenue Bill of 1924—based upon Secretary Mellon's recommendations to alleviate the condition of the taxpayer.

I do not want to burden you with any detailed description of the many changes which it seeks to make in the present statutes; but there is one little point of significance and interest in connection with our subject for today, which I want to touch upon.

In one of the amended sections which previously referred to depreciation, this much abused word is stricken out and, in its place, are substituted the words "exhaustion, wear and tear, and obsolescence." Keep those words in mind—"exhaustion, wear and tear, and obsolescence"—for they are all important to an understanding of depreciation. They are the actual physical forces which bring about this lessening in worth which is usually referred to as depreciation.

One Way to Railroad

Unless you base your thinking on the reasons for depreciation rather than the results of depreciation, you are likely to arrive at just about as profound conclusions on the subject as did the well-known Pat.

It seems that Pat held down a job as crossing gateman only a hundred yards or so from the spot where two fast passenger trains came together in a head-on collision. In one of the many damage suits following, Pat had been called as a witness. The attorney for the railroad, in suave and soothing manner, asked Pat to tell the jury just what he saw and what were his impressions of the accident.

With some embarrassment, but with a supreme effort to convey the straight of the story, Pat related: "Well, ye see, it was like this: I looks up the track and here comes No. 6 'tohellatohoot.' I looks down the track and here comes No. 3 'tohellatohoot' on the same track, and I just sez, sez I, that's a hell-uv-a way to railroad."

The great trouble with depreciation is that most of us haven't learned that we cannot eat our cake and have it. Instead of a physical force, depreciation has been regarded as a sort of accounting convenience, a handy thing to fall back upon when the books are in need of adjustment, a negligible factor in a poor year and a general hiding place for profits in an especially good year.

Fergus Mead

What Depreciation Really Is

But when depreciation is translated back into its basic factors of exhaustion, wear and tear and obsolescence, as the new tax bill does, it is no longer possible to think of it in terms of an accounting convenience. Exhaustion is just as real a thing as age. Wear and tear are as disagreeable and much more inescapable than illness. Obsolescence comes into play every time the fertile brain of the inventor or engineer conceives some new, or better, or faster, or cheaper way of performing some operation.

It is obvious, therefore, that if we are to get a proper measure of depreciation, we must look to the properties themselves, the seat of the depreciation, rather than to the books of account, where the depreciation is merely recorded.

But why should we be so concerned over this matter of depreciation, you may ask. Why should we go to any particular trouble to get hair-line accuracy in establishing depreciation? The answer is simple: Unless you figure depreciation right, your costs won't be right, and if your costs aren't right, your record of earnings and your statement of profits will be distorted. You may not know whether you will be making money or not. You certainly will not know how much you are making.

A Highly Competitive Business

I doubt whether there is any necessity for telling you gentlemen that the sand and gravel business is a highly competitive one and, consequently, that every dollar counts. An error in depreciation has just as much effect on the profit and loss statement as an error in the statement of cash on hand. It is just as wrong to say that the depreciation of a $100,000 plant is 4 per cent when it should be 7 per cent, as it is to state that a $3000 account receivable is good, when it is known to be otherwise. Depreciation is of more vital importance to the sand and gravel operator than it is even to the manufacturing executive, simply because it represents a greater proportion of his costs than it does in the case of a manufacturing enterprise. This can be illustrated by a brief example:

You may assume that a sand and gravel company has an investment in buildings and equipment of $100,000. It does, in a certain year, a business of $150,000, at a cost of $125,000. Depreciation has been figured at 10 per cent which, on a $100,000 investment is, of course, $10,000, or 8 per cent of the total cost of doing business.

Where Depreciation Bears Heavily on Sand and Gravel

In the case of a manufacturing establishment with a $100,000 plant, business for the year may amount to $500,000, at a cost of $450,000. If depreciation here is figured at 10 per cent or $10,000, it only represents a little over 2 per cent of the total cost of doing business. Two per cent as opposed to eight per cent! Is it any wonder that sand and gravel operators are evidencing more and more interest in this matter of depreciation?

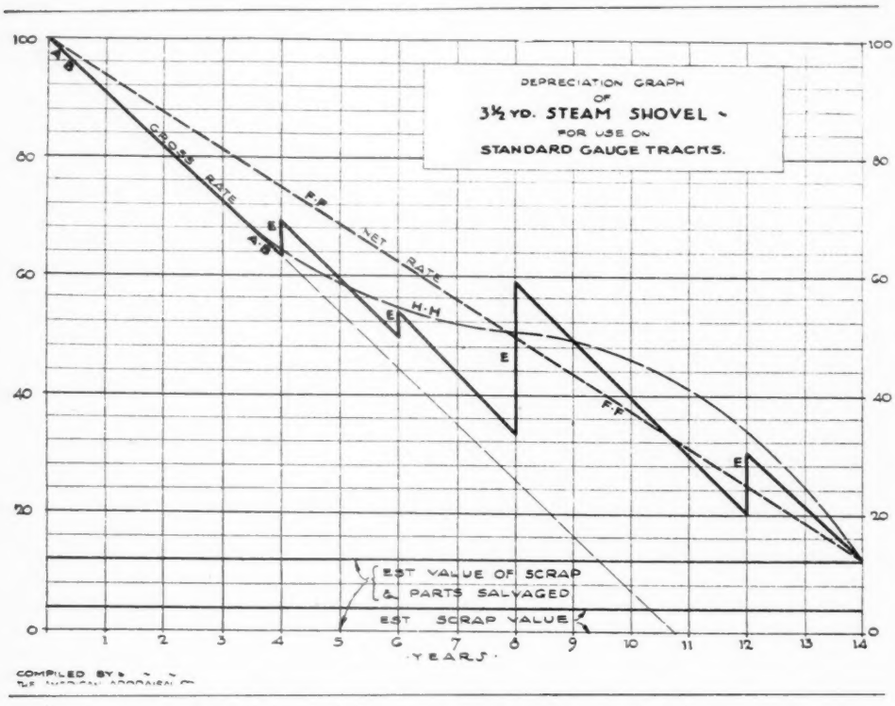
What are we going to do about it? How can we guard against these insidious errors traceable to depreciation, which tend to distort our earnings statement? How can we be sure that we are setting aside enough money in the depreciation reserve to replace our investment in a unit of property when that unit has lived its life through and has been relegated to the junk heap? The answer is—*a study of your property.*

Property, as generally listed on balance sheets, is a permanent asset, but in reality

it is a mighty temporary thing. The end is bound to come—very soon, if it is not well taken care of, and a bit later if maintenance and repairs are not carefully watched. But the end is as inevitable as death itself.

All your depreciation reserve is for is to guard against this final loss from death, to spread it out over a series of years rather than taking it all at once when the property finally lands on the scrap pile.

Depreciation is, in many respects, similar to insurance through which you take a possible loss in a series of annual premiums rather than in a lump sum when the fire wipes out your property. If you pay a certain sum out of earnings each year, through the medium of premiums, your insurance company gives you enough to replace your property when it burns down. So also, if you pay enough out of earnings through the medium of increments to your depreciation reserve, you will have enough to replace your investment when the property has worn out.



How depreciation may be figured on a shovel

Straight Line Method

This method of spreading out the loss in a number of equal, annual installments is commonly known as the "straight line method." It is determined by deducting the percentage of salvage value from 100 per cent and dividing the remainder by the years of expected life.

If you have made an adequate study of life expectancy, maintenance and of some other things that I will touch upon in a minute, the straight lime method will probably produce as accurate results as any other presently known method, and it has the important factor of simplicity to commend it. It must be borne in mind, however, that it will not produce the actual accrued depreciation at any point except at the point of expiration. The annual rate of depreciation is dependent upon life expectancy, which in turn is dependent upon operating conditions, maintenance and known advances or improvements developing in the type of property under consideration.

Now, let us see how these various factors affect the rate of depreciation on a particular piece of equipment with which I assume you are all familiar, a steam shovel. A steam shovel is comparable in many ways with a small manufacturing plant. It has its power plant, its building, its machinery of various types and of various periods of duration. Obviously, it is folly to consider a complex mechanism of this sort as but a single device upon which depreciation might be computed as a unit.

If we are to arrive at a rate of depreciation which is the result of any sort of scientific analysis, we must consider the shovel as a group of related but different items. Let us reduce our computations to graphic form: On this chart the straight line "F-F" represents the straight line or net depreciation about which we were speaking a moment ago. It must be borne in mind, however, that this is the answer, but the means of obtaining the answer.

The irregular line "E-E" represents the offsets to depreciation accomplished through expenditures for replacements of parts, that is, maintenance during the life of the shovel. This continual arresting of deterioration, and also frequently of obsolescence, is the big governing factor in the prolongation of life.

Replacements

As you will note, the deterioration starts along the line "A-B," but in the fourth year it is arrested by the first major replacement, the replacement of the bucket and of the boiler tubes, each of which has but a four-year life. Once more, deterioration sets in and the curve of value starts on the downward trend, until it receives another jog upward through the replacement of the dipper stick. The next and largest replacement occurs in the eighth year, when the boom, the bucket, the car wheels and the boiler tubes are all replaced. The last replacement, that of the dipper stick, the bucket and the boiler tubes, is made in the twelfth year.

In the fourteenth year we find that the value of our shovel has dropped until it is no higher than the salvage and scrap value of the various parts. Further replacement becomes impractical and we reach the end of the life of the shovel. It might happen that the owner would consider he had reached the end of the practical life of the shovel at the twelfth year, when its value is within 10 per cent of salvage.

Now, when we deduct the salvage and scrap value, we find in this particular analysis that the annual straight line rate of depreciation is about 6.28 per cent on the complete shovel.

The compound curve "H-H" reflects the approximate condition of the shovel at the various periods of its life. This net rate of 6.28 per cent represents the depreciation not offset by maintenance. It would assume the charging of all maintenance to expense.

Setting Up a Reserve

If it is desired, however, to set up a reserve sufficiently high to recover the cost of maintenance—the major replacements which we have referred to—as well as the depreciation not offset by these, we must add to the net rate, the rate for maintenance, 3.395 per cent. The sum of these two, 9.68 per cent would be the gross rate of depreciation. That is, if we set aside each year 9.68 per cent of the cost of the shovel, we will accumulate a sufficiently large sum of money to pay for the major replacements as they become necessary and to retrieve the total original investment in the steam shovel, less salvage value and less minor repairs and maintenance, at the end of its 14-year life.

It is very apparent, therefore, that the maintenance policy and the accounting practice of each concern have a very important bearing on the depreciation rate. It is misleading and dangerous and foolish to lay down any arbitrary rates of depreciation for an entire industry. We cannot say that each of you should figure the depreciation on a steam shovel at 9.68 per cent unless there is an absolute uniformity in the accounting practices and maintenance policies and conditions of

operation of each of you, or unless there is some means established for accurately gaging the deviations from these standard conditions and practices in the property under examination.

Nor is it any more logical to lay down a rate covering all of the property of even a single concern. Certainly, the depreciation on a steam shovel never has been and never will be the same as the depreciation on industrial tracks and any attempt to make it so on the books of account are misleading.

The broadest classifications of property which it is possible to use and attain anything like accurate results are shown on this chart. Even these should, in most instances, be subdivided or grouped according to buildings and locations, inasmuch as a particular piece of machinery would be subject to greater wear and tear and greater effect from the weather in one situation than it might be in another.

It will be seen that a rate study of this sort is a highly exacting investigation. It requires specific study of each unit of property, of its age, its history, the character of its maintenance, the general and specific conditions in the industry, the trend in design and construction. It demands an impartial viewpoint, an unbiased regard for the facts and the facts alone. It is, in a word, a specialized undertaking.

Too Much Simplicity Is Misleading

In the past, the rate studies were frequently neglected in favor of something alleged to be more simple. With a general increase in efficiency, however, with keener competition and a greater need for exact figures on cost, with the coming of better accounting methods and with the requirements of the federal income tax law, business men generally have come to a realization that it is just as essential to investigate the true status of depreciation as it is to ascertain whether your accounts receivable are good or whether you are selling your product for more than it costs you to produce it. Depreciation rates, let us repeat, have a most decided bearing on profit and loss.

Thus far, we have devoted our discussion of depreciation to but one phase of the matter—the establishment of proper rates which will duly reflect the operation of the forces of wear and tear, exhaustion and obsolescence. But this is but one step in the handling of depreciation in property accounting. Once the rate is established, to what shall we apply it? Shall it be to the original cost, thus serving to retrieve the outlay; or shall it be applied to current costs of reproduction, thus perpetuating the results of outlay? In other words, do we want our depreciation reserve to accumulate sufficient money to equal the money we invested in the property, or do we want it to accumulate a sufficient sum to buy a new unit of property when the old one is worn out?

There is a very considerable difference between these two courses, as this chart will indicate. If we base our depreciation on actual cost and we buy our property in 1913, we get back an amount of money indicated by the 1913 level on the chart. But dollars buy considerably less now than they did in 1913 and, as a consequence, it takes a great many more of them to buy the same unit of property now. Hence, the cost of reproduction theory of depreciation would demand that our depreciation base be a sum indicated by the position of the curve in 1923.

This matter of basis is a hotly contested one. You will find many exponents of both policies, each with apparently insurmountable obstacles to any deviation from its course. One thing, however, is certain. For computing federal income taxes—or rather for computing the income taxable under the Revenue Act of 1921 or prior acts—depreciation must be computed on the basis of the actual investment in the property, unless it was acquired prior to March 1, 1913, in which case it may be applied against the fair market value at that date.

Even in the face of this inescapable requirement, there is a growing tendency on the part of plant executives to supplement this basis with another. It is argued that a method which will not lead to trouble with the Bureau of Internal Revenue, which will not distort your costs, that will make it possible for you to more equally apportion the cost of replacement, is to regard that portion of depreciation based on acquisition costs only as legitimate charges to operation. The balance, that is, the difference between depreciation on cost and depreciation on replacement value, is then regarded as a charge to surplus. This practice would build up a reserve for renewal which would be a portion of surplus set aside and available in the future for ultimate renewal of the plant.

In stating, however, that original costs must be used in arriving at taxable income, we do not necessarily mean that book costs should be used. For, unfortunately for the taxpayer, books of account seldom tell the truth as to the sum total of investment in property, simply because so many depreciable assets are charged to expense or vice versa.

It is a sad commentary on the past accounting practices of the nation to find, as we have during the last five or six years, literally hundreds of excellently managed businesses whose records of investment were so distorted as to make differences in their taxes of amounts varying from a few dollars to many hundreds of thousands of dollars.

Distortion of Accounts

Every time an expenditure on property is charged to expense, when in reality it should be charged to capital, the base sum on which depreciation is computed is distorted to just this extent. During a period of years, these distortions usually amount to so much that thousands and thousands of business concerns have mistrusted their books of account and have had an analysis of their property made to give them an accurate basis for charging depreciation. Even had there been no federal income tax to serve as a goal in forcing upon the business of the country a better recording and control of physical properties, it is most likely that the lesson would have been learned before long anyway.

There has been a general awakening on the part of management and stockholders to the realization that the charging off of more depreciation than the actual exhaustion, wear and tear, and obsolescence of the properties would warrant meant nothing more nor less than the withholding of profits legitimately due the owners of the business. And contrariwise, that the charging of too little depreciation and the consequent distribution of a greater part of the income was but the payment of dividends in part from capital.

A Partnership with Uncle Sam

Regardless of how soon the reformation might have been brought about without it, the federal revenue laws served to clearly throw the issue into prominence. Just as soon as Uncle Sam went into partnership with every successful concern—and that is

Broadest Possible Classifications Practical to Use for Computing Depreciations

RAILROAD SIDINGS
INDUSTRIAL RAILWAY
WELLS
LAND IMPROVEMENTS
CONSTRUCTION

Dwellings
Electric Lighting System
Heating System
Fire Protection Piping

EQUIPMENT

Machine Foundations
Power Plant
Power Piping
Motors
Power Feed Wiring
Excavation and Hauling Equipment

Machinery
Crushing, grading and washing equipment with elevators, conveyors, pumps and accessories.

Line Transmission
Machine Pulleys
Machine Belting
Spouts and Chutes
Water Piping

Minor Equipment
Includes factory furniture and fixtures, permanent and perishable tools, small trucks, scales, perishable equipment, etc.

Office Furniture and Fixtures
Horses
Wagons and Harness
Automobiles

Compiled by the American Appraisal Co.

what the income tax amounts to—that concern was forced to reform. The present difficulties with which nearly every taxpayer is surrounded are due largely to his past failure to live up to the tenets of good accounting. It is a sweeping condemnation, but, in practically every instance, will be substantiated by a careful review of the facts.

However, I fear I am diverging somewhat from the subject about which you are most interested, the establishment of depletion on sand and gravel properties for federal tax purposes. Nearly everything we have said about depreciation applies with equal force to this matter of depletion, for here again study of the property and full knowledge of the facts is far more satisfactory than arbitrary estimates. The Bureau of Internal Revenue has a very legitimate antipathy towards opinions "expert or otherwise" and insists that substantiating data be furnished whenever a statement is made.

The big problem in connection with depletion lies in the determination of the base sum recoverable through the depletion allowance. Here again, we are controlled, insofar as the computation of taxable income is concerned, by the Revenue Laws and Regulations. We must use either March 1, 1913, values in the case of all deposits owned at that time, or actual costs for those subsequently acquired.

This base sum is absolutely compulsory. What you paid for a property is your investment in it and represents (except where March 1, 1913, values are permissible) the amount which you can recover through depletion.

Suppose, however, that we must determine a value basis as of March 1, 1913, or a value for purposes of financing. What is the value of a sand and gravel deposit? How can it be determined? Is it the price paid for the land, or is it something over and above this sum?

How to Know What Your Property Is Worth

The revenue laws tell us that value may be determined as the amount which a willing buyer would pay a willing seller. It is not difficult to imagine an instance, however, where a farmer would be only too willing to dispose of a tract of land for farm land prices, where the purchaser was acquiring it, also willingly, to exploit the sand and gravel resources underlying the surface. Here is a case of a willing seller and a willing buyer, but obviously the purchase price as farmland is a meager index of its value to the sand and gravel operator. In the case of natural resources, we must usually look to eraning capacity for evidence of value.

The analysis of this earning power necessitates a thorough understanding of the conditions and economics of the sand and gravel industry. Such factors as the nature and quality of the deposit, its accessibility, the available market, the amount of competition, the extent of the deposit, the transportation facilities, the cost of development, and operation, labor conditions, ability of the management, all these and more must be studied and weighed in arriving at value.

For the sake of illustration, let us demonstrate the method of valuation commonly employed by enlightened investigators by taking a typical example and following it through the various steps necessary to arrive at a conclusion which would be capable of demonstration.

A Concrete Case

Let us assume that we have a deposit to be valued covering 100 acres on which there is a total recoverable quantity of 3,000,000 tons of sand and gravel. The annual rate of recovery is 200,000 tons and the remaining probable life of the deposit is, therefore, 15 years.

Now, let us assume that after a careful analysis and study of the conditions surrounding the working of this deposit, we find that the cost of recovery amounts to 90 cents per ton or an annual cost of $180,000. This covers the cost of excavation, preparation and selling, based upon a production of 200,000 tons and includes labor, fuel, supplies, selling expense, depreciation, maintenance on the necessary plant, interest on the investment and working capital.

It now becomes necessary to make a careful study of the particular market conditions surrounding this property. These might indicate that the expected revenue would amount to $1 per ton or an annual gross revenue of $200,000. The annual profits would, therefore, be $20,000.

Find the Present Worth of Income

The problem now resolves itself into this question: What is the present worth of an annual income of $20,000, for 15 years? At first thought, it might seem to be 15 times $20,000 or $300,000 but this is wrong, for two reasons: In the first place, this amount, although ultimately realized, comes to the owner in 15 annual payments and he does not have the use of the last $20,000 for 15 years, the next to the last for 14 years, etc. Secondly, these estimates have been based on differences between selling prices of sand and gravel and costs. You gentlemen need no explanation of the possibility for error in such estimates and although both costs and selling prices are determined and prophesied as accurately as possible in the light of the existing conditions, there are so many unforeseen conditions affecting these estimates that a factor of safety is generally used before determining the present value of the annual expected profit of $20,000 for 15 years.

Know Your Property

We are now in a position to legitimately apply the test of the willing buyer and the willing seller, but not, however, to the deposits themselves. What we must consider here is the amount which a willing buyer or a prudent investor would pay out for an annual income of $20,000 for 15 years. The first thing he would do would be to apply the factor of safety already referred to. After carefully investigating the conditions and prospects of this particular business, he would decide that he was willing to pay outright for an income of only $10,000—half the actual expected income.

All that remains, then, is to determine the present value of an income of $10,000 at 8 per cent for 15 years. Reference to any interest table will show that the present value of an income of $1 per year, at 8 per cent for 15 years is $8.55948. This times 10,000 gives us approximately $85,600. This, then, is the value of the deposits, the measure of their capacity to earn, the amount which the willing buyer could be expected to pay for the right to the earning from the deposits.

This is the method most commonly used to determine value whether it be present-day value for financial purposes or value as of March 1, 1913, or any other prior basic date for federal tax purposes. In the latter event, only those conditions in evidence at the date as of which the appraisal is being made are taken into consideration.

With the values thus established, or assuming that $85,600 is the investment used as a basis for depletion, the computation of the unit rate of depletion is made simply by dividing the value by the number of tons available. In the above case, the depletion rate would, therefore, be $85,600 divided by 3,000,000 or $.02853 per ton, and the amount deductible from taxable income for depletion in the year would be this sum times the number of tons produced, 200,000 or $5706.

That is the process and we have gone about as far as we can in explaining it in general terms. To go a step further means to come to specific cases, for each one is different and each must be handled in a different manner. Generalizations regarding depletion are as dangerous and as misleading as the use of arbitrary rates of depreciation. We encountered a case, for instance, just recently, that of a coal mine, where a variation of but one cent in the cost of operation or in the selling price of the coal meant a difference of $70,000 in the value of the deposit.

Obviously, this is an exaggerated case, but even in the typical examples which we used earlier in this talk, it is evident that depletion and depreciation are of vital importance, representing as they do more than 12 per cent of the total cost of doing business and influencing the accuracy of your earning statement dollar for dollar, as does the cash account, the accounts receivable or accounts payable.

Once more we may say as the best instructions in a delicate situation: *Know your property.*

If any of you have any questions, I am sure Mr. Jackson will be glad to answer them.

Discussion on Depletion, Depreciation and Income Tax

Conducted by F. W. Jackson
Of the American Appraisal Co., Milwaukee

MR. SMITH: What do you do in the case of double shifting a steam shovel or in a case where you work it 25% double shift?

MR. JACKSON: Any rate of depreciation should be established for a standard daily period of operation; and accelerated depreciation taken during period of the year, when overtime operations prevailed.

MR. JONES: In arriving at the valuation of the deposits was the value of the equipment and plant considered?

MR. JACKSON: It is expected that a reasonable return should be earned upon the plant property. Ordinarily, the rate of earnings on the plant properties would be somewhat less than the rate used in determining the value of the deposit. The plant properties should have a more stable earning capacity than the deposits, as they do not have the same investment hazards.

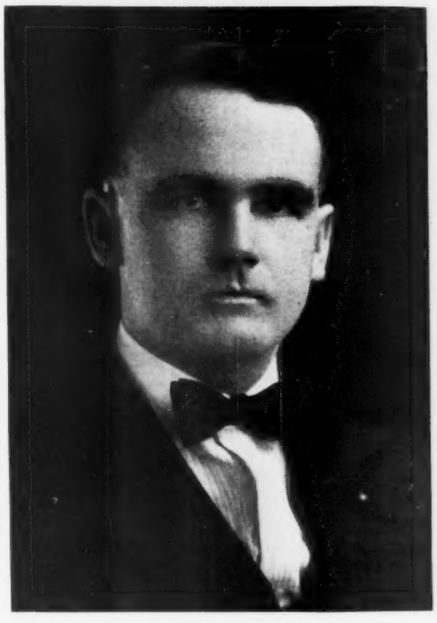
Depreciating to 40%

MR. BRADLEY: I would like to inquire about the steam shovel: On steam railroads where their cars are interchanged all over the country, one car might be destroyed down in Maine. The railroads have a rate of depreciation for settlement that goes on usually at 6% a year, but the car never was supposed to be depreciated more than 60% of its original value, that is, if it can still roll on the railroad, it has still 40% of its value. I would like to inquire if that isn't nearly true of the steam shovel.

For instance, we operate two steam shovels, one is 70C, which is quite modern, the other is 40 years old, both of them are good today. Now, of course, the shovel 40 years old, when it was built, had full valuation, since that time we have had to add a new boiler, etc., but I figure something like the railroads do, when you have depreciated that down, will you have 30 or 40% of the original value if you still use it? You can't go much lower with it.

MR. JACKSON: The theory of depreciation, particularly as established and considered by the treasury department, is that the original cost or March 1, 1913, value can be recovered as depreciation during the life of the property. Proper adjustments should be made at the expiration of this life for the remaining salvage value. The theory of depreciation would not operate properly if you limited the depreciation to 60%. In such a case the shovel might show a 40% value today and salvage tomorrow and the difference would have to be absorbed as a loss when the abandonment occurred.

I think the point you have in mind is that of its operating efficiency, rather than so-called accounting depreciation. It is from a viewpoint of operating efficiency that a shovel or any industrial equipment is seldom allowed to depreciate below some 60%. If it is depreciated below that point from an operating condition you could not operate it economically. However, if you continue to maintain a 60% investment in that shovel, there is some period coming at a later date when that 60% must be entirely absorbed in one year's earnings, that being the date when the shovel is abandoned.



F. W. Jackson

MR. BRADLEY: In the case of the railroad, the unit never goes below 40%, you can take over 60% but the 40% always remains, that is, if a B. & O. car is destroyed on a railroad down in Maine, the railroad down in Maine must pay 40% of its original value. Of course, that covers a vast property that has been worked out in a great many years, and it is something you cannot very well overlook in a discussion of depreciation. The steam shovel, if used at all, if you still use it, you cannot get much below 40% of the original value.

MR. JACKSON: I think that reference to this chart of the steam shovel depreciation will fairly well answer that point. You see from this chart the renewals that extend the life of the shovel. This curved line represents the average and maintains a condition of from 40 to 50% of its original efficiency to the point in the shovel's life where it becomes more expensive to maintain that shovel than it would be to abandon it and buy a new one. From that point, depreciation is not offset by renewals and the resultant loss in value is very rapid until the time it is abandoned from use.

MR. SNODDY: May I ask in regard to the depreciation in property: Just suppose a case of 100 acres bought at $100 an acre, carried on the books at that rate, being used up ten acres a year. That means you are going to depreciate the entire property in ten years. Supposing a man is operating in a locality where there is a small amount of gravel, a surplus of sand we will say; he wastes one-half of the sand that is taken out of the property, lets it spout out on the ground. He moves his plant away; there is nothing but a hole in the ground filled up with a large pile of sand. He has moved to a new location; it is off his books; it is so worthless that he has decided to let it go for taxes rather than redeem it. But eventually there comes a fellow who wants to set up a brick making plant and sand is useful, and he strikes a trade and sells him the location, we will say for $10,000. Now, what would the income tax people say to him as having depreciated too fast or not leaving any residue to apply on this sale?

Advance in Property Is Income

MR. JACKSON: I rather expect that would be considered as income; you had depleted your property of the natural resource which gave it a value when you first acquired it or as of March 1, 1913, and subsequent to that time this other value has accrued to the property, not due to appreciation in prices or a discovery of a new deposit, but due to new methods of production requiring a new use for that deposit, so that you would not be able to establish a value for that as an offset to the income.

MR. SHIELY: I think the sand and gravel industry is probably one of the businesses of the country which has paid less attention to its bookkeeping methods and its income tax problems than any other probably due to the fact that the deposits are found on the property of people who never had any business experience before. A great many concerns have gotten into difficulty with their income tax for that reason. I want to bring out one feature of it and see what you would do under these circumstances:

Assume that a concern did a very large business in one year or two or three years, and that concern had a very low capitalization. Its relief from excessive income tax lies in the application of the so-called Section 327 or 328, which compares the tax that it should pay with a like concern doing practically the same business and making

about the same amount of money. Now, after that application has been made, could that concern then capitalize itself at a capitalization which would yield an income of that kind?

MR. JACKSON: They could not for purposes of federal taxes, no.

MR. SHIELY: They would have to go on from year to year?

MR. JACKSON: The application of Sections 327 and 328 applies only to the years which it is tested, and the conditions may be different during each year.

MR. SHIELY: Has it been your experience that there has been relief generally given under that section?

MR. JACKSON: Yes, ordinarily, where excessive taxes have been paid and where it was proven that the invested capital of property does not represent the facts.

MR. SHIELY: With that factor proven, could a concern of that character go to a reputable appraisal concern and set up as invested capital, its worth at that time.

Handling Undercapitalization

MR. JACKSON: They could not set up its worth as of that date, but assuming they are under-capitalized, for different reasons, the principal being that resulting from the practice of charging all capital assets as expense, when these assets are still existent and forming a part of the plant properties necessary as income producing equipment, you would be permitted to restore the cost of these original items of equipment that have been charged to expense. If the recorded costs are not available, under the provisions of the treasury decisions you would be permitted to have the property appraised as of the date it was originally acquired and use that as a part of your invested capital or basis for depreciation.

MR. SHIELY: Even though it was after the year 1913?

MR. JACKSON: Yes, either before or after.

Depletion Not Based on Income

MR. McGRATH: In your theory, you are basing your depletion on income. Now, can you do that? Our experience has been that the government will permit you to charge off for depletion only the amount that you have paid for the property. For instance, we will take the basis of $10,000 earning per acre, suppose you paid $500 an acre for that land, our experience has been —and we have discussed it with the department—to let us deplete that on the proposition of earning, but they will not permit, under the law, to deplete it more than $500 an acre, the actual amount you paid for the land. What is your theory on that?

MR. JACKSON: I think you missed one point in that. If the property were acquired subsequent to March 1, 1913, the cost is the only amount that can be recovered through depletion; if it were acquired prior to that, then the amount you can recover is its fair market value as of that date. In determining its fair market value, it is contended that the best evidence is the earning power of the property itself.

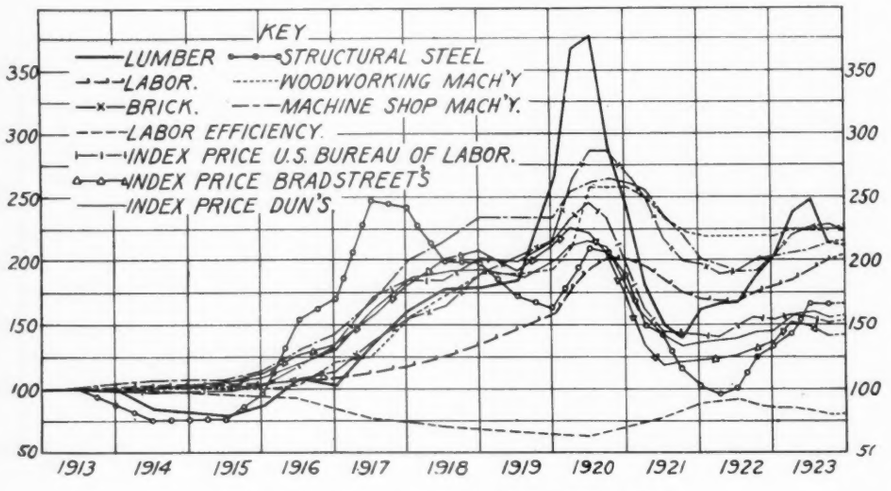


Chart showing course of prices since 1913

MR. McGRATH: In that case, suppose you have $10,000. earning per acre, at what would you fix the value of land if you paid $500 per acre for it?

MR. JACKSON: I would hesitate to say, based on that information alone. Does the earning of $10,000 per acre consider the entire acreage or is that the acreage depleted during the year?

MR. McGRATH: We are taking the unit of an acre.

MR. JACKSON: You should first consider your plant investment and that you would have to earn a reasonable return on that plant investment before any earnings could be attributed to the natural deposits. The plant investment would not have been constructed except for the natural deposits, so that it is proper to deduct then a fair interest return on the improvements before considering your natural deposits. The excess earnings may then be attributed to the deposit resulting from the favorable location or some other features inherent in the deposit itself, and a proper capitalization of these excess earnings over the life of the deposit is a reasonable basis for determining the fair market value as of the basic date where such a valuation is permitted.

MR. McGRATH: On that you determine your depreciation. From your argument, you would have to set up a fixed amount per acre before you can charge off depletion, and the government generally prescribes that you are not to charge off more in depletion than you actually pay for your land. Isn't that true, regardless of whether it was purchased before March 1, 1913?

MR. JACKSON: No, if you bought the property before March 1, 1913 and the property is valued in excess of cost you can recover, through depletion, its value as of March 1, 1913. If it were acquired after March 1, 1913, then the amount which you can recover is its cost.

MR. McGRATH: Suppose you buy an acre of land tomorrow for $500 on that basis, what could you charge off for depletion at the end of the operating year, suppose it was worth $1000, but you only pay $500.

MR. JACKSON: $500 is all you can recover.

MR. McGRATH: The gentleman who preceded you stated that the depletion should be based on the earnings of the land, and I do not think that can be done.

MR. MEAD: May I explain, Mr. Jackson? I said there that the fair market value as of March 1, 1913, was based on the earning value of those properties. The basis for that depletion must either be the cost at which it was acquired since that time or the value as of that date if acquired before.

Is Appreciation Taxed?

MR. SMITH: In order to establish an appreciation, which that would be, you would first have to set up the appreciation on your books, in order to get the excess depreciation, and, in setting up the appreciation, would not the government then make you pay that as a profit at the time you set it up?

MR. JACKSON: No, sir. There are specific provisions in the law and regulations that the appreciation at March 1, 1913, is not profit.

MR. SMITH: I understand that about March 1, 1913, but just as Mr. McGrath has stated, supposing you buy a piece of property on the basis of $500 per acre, and after you get it you find that you are accurately mining that out, and you take the acre—we will say for arguments sake it has developed to $10,000—you would have an appreciation of $9,500. Now, if you are going to take the excess depreciation, don't you first have to set up that appreciation?

MR. JACKSON: If that appreciation occurs subsequent to March 1, 1913, and

eliminating the discovery value feature, the government would not recognize that as income nor would they allow you to deduct it as subsequent depletion. They would only allow you to deduct as depletion the amount based on the $500.

MR. SMITH: I would say, in case of that appreciation, you would have to pay an excess profits tax on that $9500 based upon profit, first, and then they would allow you depletion afterwards.

MR. JACKSON: They would not allow you to set up the value for depletion; you would not have to pay the tax as you would not be allowed to capitalize the value of the property on that basis, for federal tax returns. You would have to stay on the basis for your original $500 investment.

MR. SMITH: You would have to continue to deplete your property on the basis of $500 and your property may be worth $10,000.

MR. JACKSON: Yes, even though it might be worth $10,000.

Permanent and Temporary Equipment

MR. POTTS: There is one question in regard to deductions for equipment that I would like to hear discussed. We have two characters of plant or equipment; one movable, such as steam shovels, cranes, draglines, etc.; the other fixed plant, such as washing plants, pump houses and other buildings. On the last we can recover practically nothing upon exhaustion of our material deposit. Suppose we build a plant and find that we have been deceived as to the amount of salable material. If we charge on this plant the allowable depreciation factor we still have, upon exhaustion of the deposit, a part of the investment for fixed plant on the books and it is worthless.

Another case, suppose you put up a plant knowing that it will not run out the length of life assumed by the usual allowable factor of depreciation. Another phase illustrating the same thing: You think you have a million yards of material that you are going to put through a washing plant and you build for that and set up a depreciation factor. You find it desirable to go extensively into ballast and work out your material deposit on that basis. You still have your investment in washing plant on your books and it is dead. What can be done in a case of this kind?

MR. JACKSON: I will answer your first question, in which you refer to fixed properties on the site, the life of those properties being in excess of the life of the deposit itself. In computing depreciation, you can limit your computations to the life of the deposit; that is, if the equipment has a normal life of 20 years, and the deposit has a life of only ten years, you can depreciate the equipment on a basis of a ten year run and recover the cost during the life of the deposit with proper consideration for sale values.

(Mr. Shiely conferred with Mr. Jackson.)

Not Necessary for Installments to Be Equal

MR. JACKSON: This gentleman brings out a point that you mentioned, that is, it is not always necessary to recover the cost of this fixed property in the terms of equal annual installments. If you want to, you can recover it on the basis of production. In the years of great production, you will have a greater amount, resulting from the distributing of the cost into units of production and cover it as depreciation in that way.

Your second question, whether a change of methods in your plant production at the end of five or six years changing the life of the deposit should affect depreciation: When it is definitely established that the life of the deposit was overestimated the undepleted cost or value may be redistributed over the revised estimate of the amount of the deposit.

MR. POTTS: Would your discovery apply to conditions surrounding your deposit? Suppose you had a deposit that was originally a wholesale deposit and then becomes a retail deposit with increased valuation, would that discovery of farm land to gravel land apply from one kind of gravel land to a more valuable gravel land? Would you be able to set up a greater value on your books?

MR. JACKSON: This would be the result of changes in methods of production or changes in methods of distributing the material itself. This is not a factor of discovery value. It is a condition inherent in the business methods and not in the deposit itself which results in that increased value.

Operating on a Royalty Basis

MR. POTTS: I have in mind a case from my own experience. In going into a certain locality we paid a substantial money consideration or bonus for a lease, although we were to pay a tonnage royalty thereafter. During a number of years of successful operation of this lease we acquired other leases in this same locality without paying any bonus. During the operation of the original lease we charged off from time to time a portion of the amount we had paid as a bonus and upon abandonment of the lease after working out all the material we charged it completely off. Later on we operated the other leases for which we had paid no bonus and even though they were possibly more valuable than the original lease we did not set up a capital account for them. Later our reports were audited and revised by a representative of the Income Tax Department and a good-will factor was asserted by him covering the entire leases and we were compelled to pay a tax on that basis. I want to know if a concern can be charged for establishing good-will.

MR. JACKSON: It does not sound reasonable from what you have stated. When did those transactions occur?

MR. POTTS: The first lease was bought in 1914, exhausted and moved off. I believe in 1917. The auditor, in 1918, took the thing up and put on the good will at $15,000 and we had to pay about $2,000 tax.

Should Make a Protest

MR. JACKSON: It does not sound right, and it would appear that a protest should be made. If you have not paid for good will, you are not allowed to set it up on the books. I would suggest that you take the question up with some competent accountant and I think it could be straightened out very easily.

CHAIRMAN DANN: Are there any further questions anyone would care to ask Mr. Mead or Mr. Jackson? If not, we thank these gentlemen very much for their able presentation of these matters.

North Carolina Talc Mining

THE Moore county talc area covers a strip of land twenty miles long by from two to five miles in width, in which the talc deposits occur in lenses in very old volcanic rock formations. At Glendon there are now in progress very extensive mining operations conducted by the Talc Product Co., of New York, which owns there two mills, one of which has been run recently. At Hemp the Standard Mineral Co., of New York, is also doing mining in elaborate underground workings.

Resumption of the mining at this time is for the ground product, which has a ready and profitable market as a filler for paper, rubber ties, roofing, cotton cordage, etc. During the period of the World War there was also a large production of pencils, used in the steel industry, but the demand for these ceased after the end of hostilities.

Moore county talc is *pyrophillite*, with an aluminum base as opposed to the magnesium base of the true talc so widely used in the manufacture of the "floating" toilet powders. It is, however, almost indistinguishable from the true talc and of an exceedingly fine quality—so much so that special operations to recover it in its finer and lighter forms recently produced over 50 tons which were sold for powder manufacture, at a very fancy price.

In 1856, when "Gulf Coal" was at the height of its early fame, the Moore county talc was also coming into wide prominence. The report of a visit by Ebenezer Emmons, the famous geologist, in 1856, made reference to its being mined and to the use of the product as a soap filler.

The conflict between the North and South stopped operations completely and there was no attempt at further mining until the seventies. Since then the properties have passed from one ownership to another and their operation has been highly irregular until the present purposeful management took charge.

Talc mining is carried on both by cuts and tunnels in the hillsides, which are from 60 to 70 ft. deep, and at Hemp by underground workings to a depth of 100 to 130 ft.

How to Meet the Competition of the Wayside Pit

By Wm. Chapin Huntington
Business Engineer, Chicago

YOUR secretary has very generously assigned me a high-sounding title for my speech, "The Exploration, Development and Valuation of Sand and Gravel Deposits," which would cover about as much territory as a corporation charter in New Jersey. As a matter of fact, what I want to talk to you about is the wayside pit. If I were a preacher and looking for a text, I think it would probably be the following: "The president of the company, after a stormy discussion, saith unto them, 'You have your opinion and I have mine, but let's get the facts; if we can get enough facts, we can settle any question without argument.'"

I appreciate very keenly this question of the wayside pit. I am not a sand and gravel man—I am a business fact-finder, but I have had the privilege of working with sand and gravel men on this question and this is my justification for talking to you about it.

Fundamental Difficulty of Sand and Gravel Industry

I get into many industries and I do feel very keenly, without handing you any flowers, that the sand and gravel industry shows a considerable measure of good nature. I wonder how many industries, making different kinds of commodities, could stand what you people are forced to stand by the very nature of the more or less universal occurrence of your material which makes it possible for so many people to butt in on a legitimate manufacturing game and very often undermine a stable industry. Of course they ruin themselves but in the meantime they hurt established enterprises.

No Royal Road—Get the Facts

I haven't any royal road to get rid of what has been called "The menace of the wayside pit." As a fact-finder my only remedy for that situation is to get the facts and use them. And the facts do exist. To understand what I mean by "get the facts" let's get down to cases, as they say, and assume a situation right here, now, which is not very imaginary either in time or location.

Suppose all of us in this room were members of an aggregate association in some nearby state, and that state was well floored with sand and gravel. Suppose we were having keen competition from two sides: from the privately-owned farmer pit and from the so-called county pit opened up by a very zealous, ambitious county engineer. Suppose in one place in our imaginary state we had a big, fine, long-established sand and gravel plant with motor truck distribution; a plant which knew its costs and knew perfectly well that it could lay down material on the road within three miles of the plant at a cost lower than the county engineer, and suppose that in spite of this the plant was not getting the business. What are we going to do for these members of our association? Only get the facts and use them.

What kind of facts? Facts about quality, facts about standards of size and cleanness, facts about costs and facts about over-production.

> ***FACTS are the weapons with which to fight the wayside pit. No one who knows the facts will believe that an unorganized wayside pit business can produce material of the same QUALITY as as cheaply as the well-organized commercial sand and gravel plant. Well-presented facts are always a convincing argument.***

Where Would You Get These Facts?

To get these facts together you need what I am accustomed to call a business survey which would result in a Book of Facts. Our Book of Facts would contain facts about market for sand and gravel in our state; how much is consumed in road-building; if the road-building program is nearly finished and if this market is therefore nearly saturated; if not, will it be saturated in a few years; the market for sand and gravel in buildings, public works, homes and factories, and what not.

Somebody asked me the other day how I would get such facts and I replied "By the use of imagination and a lot of shoe leather." We would interview many consumers of our product, state officials, makers of sand and gravel excavating and washing machinery, competitors and people in allied industries who purchase other building materials.

Once I made a survey like this for a sand and gravel producer and some of the best information came from cement and brick people, casting a very valuable side light, which had never been used, on the real market for this product in the community. Many of the best facts would come right out of our own members in this room. I have used this illustration before—and will use it now—that if we were to shut the door so nobody could get out and you would let me loose to ask everybody in this room what he knew, you would all be astounded at the information contained in the heads of those present, without going a bit further.

I used that illustration one day in a meeting not very far from here and they hardly believed it. About five minutes later they began to argue about some point so dead simple that you would suppose they would all be agreed upon it, but they were not because they had never before exhausted the information on the question. Suddenly it occurred to them that I was right and they all laughed when they realized the situation.

Facts about costs I am sure you know, but we should have to assemble facts about the county pits cost and the farmer pits cost. It might be necessary to go right out on the road with a Ford and an Ingersoll watch and check up. The simpler and more direct the method, the better.

Destructive Competition Comes from Ignorance

What good would such a business survey do us when we had it? Well, there are a whole lot of things it would do. In the first place, if we had the real facts about the production and consumption in our state, and knew just how much of our stuff is consumed in every one of the main outlets for it, there would be a whole lot less price-cutting and ruinous competition. There is nothing that produces destructive competition so much as ignorance. And on the other hand there is nothing that so readily prevents people from embarking in an industry that is over-saturated as the showing of unprejudiced figures. They would not believe you if you just told them it was your opinion that there was no room for another sand and gravel pit in a certain territory. They would figure that you have built up a big plant and have made money and there was no reason why they could not do the same thing. Once in the business, however, they find it is not so easy as they imagined and they start in to find outlets by hook or crook, chiefly by cutting prices which have a real basis in the cost of production. There is no way to stop anybody like that except sober, serious facts that he will believe.

The economic fallacy of the wayside pit in our imaginary state should be demonstrated to the people of the state because

they are the court of last resort. Suppose that many are inclined to what are loosely called "socialistic ideas." I do not like that expression but mean by it the theory of "let the government do it all." They are not going to believe any manufacturer's opinion without a backing of facts. They are going to say "He is prejudiced; he is a wealthy man, he has a big plant and that is what he would naturally say —what he would have to say." And then along comes the county engineer, no doubt very honest and zealous, but who knows about as much about business and cost accounting as a boy. He is buying machinery with the taxpayers' money and may not be depreciating that machinery as you would have to depreciate yours in your cost accounting. These facts ought to be brought out, the real unadulterated facts, from reliable sources.

Quality and Standard

I have gone far enough in your business to assure myself that sand is not "just sand" and gravel is not "just gravel." A lot of people are still living on that idea —that "sand is just sand" and that "sand is the same here, there, and anywhere else," and that "when it gets into the wall you don't know the difference anyhow." Of course that kind of thing is not going to do in the future but we want to bring that future about and make it the present as fast as we can.

Reliable facts, actual tests of roads and structures and buildings, and laboratory tests. There is a lot of this material and it ought to be brought together and put into the hands of architects and contractors and people who have to do with specifications and standards. It ought to be in the hands of state highway commissioners; it ought to be so taken for granted and as a matter of course that they would not think of buying any sand and gravel that had not been properly screened, cleaned, and classified.

Our imaginary aggregate association composed of men in this room could not get a hearing before the people of our state or of consumers without such facts as these. This was beautifully illustrated in war time when they set up government control of industries in Washington. There were certain basic industries I will not name here which could not get proper consideration for priority because they had no facts about themselves to present to the War Industries Board which would show their importance in the country, their production and stocks, their needs and requirements. This information did not exist and it had to be obtained, and by the time it was obtained, other people had gotten there first.

How to Use the Facts

Now you say, "How would these facts be brought to bear after you had them?" There are many ways of doing this. In the first place, by the tactful, personal work of every officer and every member of our association here; and in the second place, by frequent articles and interviews in the trade and technical press. The press is only waiting for this kind of material. They are looking for it and I think my friends among the trade press editors will bear me out in the statement that real facts are what they want—not hearsay or opinion.

In our imaginary state, where we have a good deal of difficulty, maybe, in convincing the public that we can deliver them better material cheaper than the wayside fellow can, the editors of county papers and small town papers are always looking for good material.

Book of Facts for Architects and Engineers

Again, if we had such a book of facts about our industry—a regular builders' pocket book lying on every architect's drawing board and on every contractor's desk—it would furnish us with an inexhaustible source of all kinds of interesting articles and would contravert unfounded arguments against us.

Another use for such material would be in skillful, collective advertising. Look at what the American Canners have done to disabuse the public mind on the harmfulness of canned foods. Study the advertisements of the American Laundry Machinery Co., which show housewives why they should send all their clothes to the laundry, and offering six different kinds of finish. This advertising is very keenly felt by the manufacturers of washing machines and is boosting the laundrymen's business.

The work of the American Face Brick Association and of the Portland Cement Association is too well known to require explanation. Nobody can count what they have accomplished by telling the world what their status is and constantly handing out facts.

People are afraid of so-called "propaganda." Of course, if you like, anything is propaganda, but I find that people do not object to being given the facts and being allowed to draw their own conclusions from these facts. There is no question but what the public is fair when it has the facts. This not a sentimental statement but is based on the experience of large corporations which have had many bitter conditions to face.

People Afraid of Propaganda

These same facts can be used in many other ways. Probably many of you gentlemen in your home communities, with your standing and prestige, are asked to talk to young men. Perhaps schools, colleges, or universities have asked you to address their classes. Now suppose that in our imaginary state there are a number of engineering schools and it is from these classes that young engineers are going out to get jobs on the county roads and to specify materials for buildings. The sand and gravel industry is a dignified industry and ought to be known as such and the facts about the industry should be told to these young men. Why should the representatives of every other industry be lecturing except representatives of your industry, which is at the very basis of building? I know plenty of schools who are looking for live men out of the business world to come in and put spice into their programs by practical talks of this kind. If our imaginary association had such a book of facts covering the whole range of our markets and our products, the question of quality and standards and all the rest of it, they would have plenty of basic material for lectures in schools.

These are just a few of the things that have come to me. I have had no time to set them down in a literary manner but they are sincere and they are "hot off the griddle." They are not out of my imagination because they come from personal contact with sand and gravel men.

In short, if the wayside pit is a menace because it is producing a non-quality, non-standardized product, which in many, and probably most, instances, it is doing, the consumers ought to know it and I doubt if they do. If the wayside pit is an economic menace in any state or community, where the state or the county with public money is undertaking functions which it cannot economically fulfill—I mean in terse language that it cannot deliver good sand and gravel as cheaply as you gentlemen can—then these facts ought to be known. How can the wayside pit, without somebody paying for it somewhere, deliver a product made with a catch-as-catch-can organization, where you have a well-organized factory proposition to do the same thing? But you have got to have the facts before you present them.

Sand and Gravel Rate Cancelled by U. S. District Court

THE special low rate on sand and gravel where used for municipal road building purposes has been cancelled, according to the traffic bureau of the Chamber of Commerce, and road materials must be shipped at the regular rate hereafter. Cancellation of the "municipal rate" was authorized when the carriers obtained an injunction in the United States district court for eastern Arkansas.

The court's action followed the precedent set by the supreme court of Tennessee in ruling that no legislative body can make rates that are favorable to itself. Subsequently it was reported that the Arkansas carriers would not avail themselves of the chance to eliminate the municipal rate, but the recent reversal has finally disposed of the question.—*El Dorado, Ark., Times.*

Geology and Origin of Sand and Gravel Deposits

By C. L. Dake

Professor of Geology in Missouri School of Mines, Rolla, Mo.

I SUPPOSE it is a fairly familiar fact to most of you that the materials that you find scattered around in one place or another in the form of sand or gravel is simply either the harder or the less soluble parts of rock masses that were once solid rock. Under the process of weathering, these rocks break down. This breaking down process may go on either through such mechanical means as the work of the frost (water being in the pores of the rock or in cracks and fractures, freezes and expands and the rocks are broken apart), or under the work of the expansion of growing roots in cracks and crevices of the rock, as a result of alternate heating and cooling of rock masses between day and night. In such ways rocks are broken to pieces mechanically.

Then also, in most rocks there are some substances, such things particularly as lime and other related compounds, that are soluble, and these go out in solution; and what you find left after these rocks have wasted ultimately becomes sand and gravel deposits.

Carried by Wind and Water

Now, in this process of making sand and gravel, to begin with, we have the coarse and fine rock particles all together in one locality. If any of you are familiar with the high mountain ridges, you know you find along cliffs large boulders graded down to the finest sands and muds all mixed together. This material is taken by various agencies, the finer material sometimes by the wind, the coarser material particularly by the work of running waters, rivers and, in some cases, by the work of waves along the beaches, and carried from its original position of weathering to various deposits.

In the process of this transportation from its place of origin to its place of deposit, the material undergoes two kinds of action; one of those is a wearing or a breaking action that grinds up the coarser material and makes it finer, and the other is a sorting process, which sorts the finer material out from the coarser. You know that a river carries fine mud more easily and to greater distances than it carries sand, and that it carries sand more easily than it carries pebbles or boulders, so that, in general, along the course of a river, you will find the larger gravels in the head water regions, sand in the intermediate regions and mud at the mouths of the larger rivers.

A very good example of that is the Mississippi river. In the northern states, the Mississippi river, in many places, yields—particularly the tributaries of the Mississipi, I should say—fairly coarse gravels; the Mississippi river itself, in this vicinity, yields little gravel but a fairly coarse grade of sand. As you go south on the Mississippi river to New Orleans and down to the delta region, the sands, where present, are very fine and a large part of the material is mud.

A somewhat similar process goes on along

Prof. C. L. Dake

beaches where the work is done by waves; the coarser material is left near the land and the finer material is transported farther out. Therefore, you get materials that are fairly clean in some regions and mud in other regions, and, of course, you get more or less of mixtures of these.

Of the form in which we find our sand and gravel deposits, we often speak of two types, bar sand and bank sand. Most of the sands and gravels, with the exception of those of the glaciated areas to which I shall make further reference in a few moments, are what were formerly old river beds, in areas where rivers no longer flow.

A good example of river gravels that are no longer directly in the channel of the river are the gravels that are familiar to many of us as "Crowley's Ridge" in the southeastern part of Missouri, gravels much like in composition, for instance, the gravels of the Meramec river or Black river, or any of our familiar streams in the Ozarks, or other gravels in other parts of the country. They are gravel deposits which have been laid down as gravel bars in river courses of streams that no longer occupy the area where the gravel is. The streams have moved or have ceased to exist.

In addition to that type of gravel, there is, however, another type of so-called bank gravel or bank sand that has never been a river deposit, in the ordinary sense of the word; and that is the glacial gravels of the northern states.

The Great Ice Sheet

It is a pretty familiar fact now that our northern states were once occupied by an ice sheet, much as portions of Greenland are covered with ice at the present time, and as that ice melted it left a deposit of mixed boulders, pebbles, sand and clay, a rather mixed-up mass without much assortment. Most of the gravels and sands and muds that were deposited directly by the glaciers from the melting of the ice lie where they were first deposited, where the ice melted, and they are not sufficiently clean at the present time to be considered commercial sand or gravel. They are more often spoken of as boulder clays, in which are large boulders, sand, gravel and clay all mixed together.

But as the ice melted there flowed from the front of the ice a number of streams, much as streams flow away from some of the Alaskan glaciers at the present time, and those streams were heavily loaded with material that was dropped as the ice melted. The streams sorted that material, so that, in general, in the northern states, in addition to having the direct glacial deposits, we have the glacial deposits that have been worked over in part by running water, water resulting from the melting of the ice, and those deposits are commonly called "glacial outwash," the term being practically self explanatory. Sometimes they are termed "glacio-fluvial" material. It is more assorted than average glacial material and pockets of material of that character are found in the northern states, ranging from Missiuri through Iowa, Illinois, Wisconsin, Michigan, Indiana, on through northern New York; those states in general that lie north of the Missouri and Ohio drainage systems.

We have much of this kind of gravel; it is a bank gravel not occupying ordinary stream channels. There are some decided differences, for instance, in the stream gravels, the ordinary stream sorted gravels and the glacial gravels. Most of the stream sorted gravels have undergone more or less sorting rather recently. On the other hand much of the glacial gravel has undergone no sorting for a considerable period of time.

I suppose most of you know that a small quantity of clay, if thoroughly mixed in a concrete aggregate is not particularly harm-

ful, but that a clay coating or film on pebbles is harmful, because it prevents the proper adhering of the cement to the pebbles. Commonly, we do not find a film of clay on river gravels or river sands; ordinarily, the surface of such a sand or gravel particle is rather free from adhering clay. On the other hand, in the glacial deposits, quite frequently we find that the surface of the pebble is sufficiently coated with a clay film that it becomes advisable to wash it (not because there is too much clay but because the clay is sticking to the surface of the pebble). Therefore distinction in the origin of those two types of sand or gravel has some bearing on its commercial value.

Earlier and Later Drift

There is another interesting thing in connection with some of our glacial deposits. The glaciers that occupied the northern states and were responsible for the formation of this particular type of sand or gravel advanced not once but several times across the northern states, and a great many years, very long periods of time, elapsed between one advance and the next one, so that it happens that we have areas that are spoken of as earlier drift and others as later drift.

The drift of north Missouri is one of the earlier drifts. Most of the drift of Wisconsin, for instance, is later. The later drift, called the "late Wisconsin drift," came down into Illinois about as far as Joliet; from there on south the glacial gravels of Illinois belong to the older drift.

The usefulness of the gravels of the later drift and the older drift are quite different, in this respect, that in the older glacial drift, over much of the United States, the pebbles have partly rotted or decayed, particularly pebbles of such rock as granite and diabase. It is possible—I have seen this myself—to take granite pebbles out of glacial drift in north Missouri sufficiently decayed so you could crumble them in your fingers, although you could see the texture of the granite. That is almost entirely impossible in the areas of the later glacial drift. Of course, the presence of such decayed pebbles is somewhat harmful for certain purposes, particularly for gravel for concrete work. When it comes to surfacing roads or making railroad ballast, it does not make so much difference. So that makes a very definite distinction between, say, the glacial gravels of north Missouri and the glacial gravels of southern Wisconsin.

Those particular points then have some definite bearing on the usefulness of the gravels. Now, in addition to sands and gravels of the origins that we have mentioned, we sometimes find sand or gravel in actual rock form; that is, the sand that was deposited possibly as a beach sand, possibly as a river sand, consolidates and makes a sandstone. That sandstone is then quarried and crushed to produce sand, and one of the most famous examples of that in the central part of the United States is the St. Peter sandstone formation of this state, or the Pacific sandstone, as it is sometimes called, or the Crystal City sandstone, that yields the white glass sand of this state.

Ordinarily, most of our sandstones yield a sand that is too fine in grain for structural purposes. It has been too thoroughly sorted. This is largely because most of our sandstone deposits have been laid down in the sea, so they have had not only the sorting and grinding effect of the rivers carrying them to the sea, but the sorting and grinding effects on the beach by the waves, which ground the material rather fine. So the St. Peter sandstone, while it is in places quarried and utilized for plaster sand is only utliized for that purpose where it is desirable to produce a very white finish and where the color of the sand becomes more important than the size of the grain.

It is claimed by plasterers and workers with cement that mortars made from the finer sands are not particularly satisfactory, and such a sand is rarely used for structural purposes. There are a few places in the United States where such sands as those from the St. Peter sandstone are utilized for plaster or concrete, but more often they are used for core sands in foundry practice or as refractory sands, or for the production of so-called acid refractories, that is, brick that is required to be subjected to very high temperatures for linings of furnaces; or for the production of sand lime brick, or glass sand.

The Work of the Geologist

I want to say, in finishing up, just a word or two about the part that the geologist is playing nowadays in the opening up of sand and gravel deposits. Of course, it is a fact, probably more familiar to most of you even than to me, that there has been a very rapidly increased demand for gravel in the last few years for highway work, as a result of a very active campaign for improved highways in many states. Especially is this true of the states of Illinois, Wisconsin and Missouri. Perhaps I would better say that I know particularly of the conditions in those states and that geologists are now being employed by the highway commissions and have saved the commissions thousands of dollars in locating satisfactory sand and gravel deposits, and that this is particularly true in the areas of glacial sands and gravels.

The subject of glaciology used to be considered not as an applied science but a pure science. People studied it because they were interested in it but not because they thought it could be turned to any dollars and cents usefulness. But at the present time the state of Wisconsin is using data worked up by one of the most experienced glaciologists in the United States, Frank H. Leverett, to aid them in certain problems of the distribution of glacial deposits as an aid to the location of sand and gravel materials. Geologists are playing an increasing part in problems of that kind.

Discussion

SCOTT BOND: I want to know if I understood the gentleman to say that this glass sand or silica was fine for making fireproof brick and yet it was not good for concrete?

PROFESSOR DAKE: May I say, in response to that question, that the geologists are not or have not been particularly concerned in actually making tests on those things. The remarks that I made in that connection are really quotations from two or three of the best authorities on masonry construction; engineers, not geologists. The geologists can tell you something about the sand deposit, but when it comes to the application of sand for any specific work, the engineer usually determines that rather than the geologist.

Kelly Island to Double Output of Hydrated Lime

THE Kelly Island Lime and Transport Co., which owns extensive lime kilns three miles east of the city, started work this week to rebuild its plant with concrete and steel. All wooden kiln sheds and all inflammable material is being replaced by concrete and steel construction.

A. C. Shultz, the company engineer from the main office at Cleveland, is supervising the construction work.

Among the improvements to be made at the kilns will be a steel tower and tank, a new hydrating lime unit, new conveyor system and new mill equipment. It is estimated that when the construction work is finished, the plant will double its present output of 100 tons of hydrated lime a day. A byproduct is quick lime fo lump lime, as it is more generally known. The company is using its own labor in putting in the new construction work with the assistance of several men employed from the city. When the steel arrives the company will send one of its steel experts to supervise this part of the work. When this work is completed, it is planned to install a new lime storage bin, also to be of fireproof construction.—*Huntington, Ind., Herald.*

Indiana Rock Products

BETWEEN 5,000,000 and 6,000,000 tons of gravel, the aggregate value of which was more than $3,000,000, were taken from Indiana pits last year, says a report by Dr. W. N. Logan, state geologist. During 1920 Indiana produced $7,579,303 worth of building stone; $1,397,554 of crushed stone; $18,649,115 of cement, and $1,348,819 of lime.

Indiana ranks second in the production of oil stones and two counties produce 70% of all the limestone used in the United States for building purposes.

Glacial Sand and Gravel

By E. GUY SUTTON
Carmichael Gravel Co.

AFTER this very instructive talk by Mr. Dake, it is a rather difficult task for me to say anything in addition, in fact, I would not say anything except that I do not like to back down on the proposition, What I do have to say will probably largely be a reiteration, in more general terms, of what Mr. Dake has said.

The materials of which the earth is composed, because of their chemical characteristics and their physical effects, have been classified by geologists under three common heads, air, water and rock. The first two, air and water, in various combinations and processes, have been the agencies that have broken up the solid rock, resulting in a loose covering generally known as mantle rock. This mantle rock may be classified according to size or degree of disintegration into boulders, gravel, sand, clay and dust, frequently mixed with decomposed organic matter.

While the sand and gravel producer, as a matter of general information, may be interested in learning the history of the earth, as written indelibly in the rocks which form its outer crust, yet in a commercial way, he is more directly concerned in two phases of the subject; first, the quality of the stones or particles of which a deposit may be composed; second, the manner in which a deposit may have been sorted, transported and laid down; the two being closely interrelated.

Quality Depends on Origin of Deposit

The quality of any particular deposits depends primarily upon the origin of the materials which compose it, but is also greatly affected by the distance and manner of travel of the component parts. For example, it might be concluded that the quality of the deposit was satisfactory, if it had withstood the forces of nature responsible for its formation, but this is not a safe rule to go by, for the transporting agency may have carried hard rocks like basalt, granite and trap for great distances, only to pick up sandstone, limestone, shale and certain iron oxides near the end of the journey, and thus the hard rocks are mixed with those of an inferior character, so far as durability is concerned.

It is a well known fact that water, either in a fluid state or in the form of ice or both, has been the means by which rocks, after being torn from their parent beds, have been transported to a new location and there dropped in a heterogeneous mass. The view is held by most geologists that the extensive deposits of sand and gravel found in parts of Wisconsin, Michigan, Minnesota, Ohio, Illinois and Iowa, and some of the northeastern states, probably as far south as New Jersey, are of glacial origin.

The theory is advanced, and there is much evidence to support it, that glaciers spread over these regions at various times, advancing and receding as temperature changes came about. These glaciers, it is claimed, not only carried along the loose stones collected at their base, but tore away rocks from cliffs and elevations and gathered additional debris from avalanches which swept down from the sides of the valleys through which these glaciers slowly plowed their way.

It is held that when the glaciers reached a point where the temperature changes induced melting, the solids dropped and then the water derived from the melting ice took up the work of further assortment and transportation, washing away for the most part the mud and silt, leaving the fairly clean sand and gravel behind. Swift flowing streams coming from the melting ice carried the sand and gravel for great distances beyond the point reached by the glaciers; such deposits are known as fluvioglacial deposits.

More Modern Theories

Some of the more modern geologists, however, do not accept the glacial theory and attribute the transportation of sand and gravel from one locality to another and its deposition into beds entirely to the action of water. If this latter theory be true, then the deposits of sand and gravel that are being worked today, whether found in streams or in banks, are all of the same origin, that is, due to the carrying and sorting power of running water, under various velocities of current.

But irrespective of the forces of nature which have been responsible for the wide distribution of sand and gravel, the main point to be taken into account, so far as the sand and gravel producer is concerned, is the great variation that is found not only in separate deposits but in the same deposit. For this reason, it is important that a very careful and thorough investigation be made of the deposit before money is invested in equipment for its exploitation.

Good Commercial Gravel Deposits Are Scarce

As a matter of fact, there are so comparatively few deposits favorably located, which have material of a desirable character and quality, taking into consideration the suitable proportion of fine to coarse particles and free from excessive clay, that it may be truly said that commercially practical sand and gravel deposits are very, very scarce. It especially behooves the uninitiated in the pitfalls of sand and gravel production, therefore, to be sure of his ground before embarking in the business, for many bright prospects have been blasted by failure to test adequately the deposit previous to installing the plant.

Prospecting for Gravel

By R. SNODDY
Coon River Sand Co.

I CANNOT understand, Mr. President, why you would call upon me to say anything after those two gentlemen have said it all, or so nearly all, I, naturally, like anyone who expected to say something, kind of jotted down a few little notes, but I find these fellows have been making use of them, so I will not look at them. I will turn the thing around entirely from what I originally intended to say.

The common average sand and gravel man does not care whether this stuff came down through the rivers or from a glacier, or because there was a big mountain heaved up here one time and this sand and gravel happened to be on top of it and pushed over to one side. What he wants to know is—how to find it.

Not being an educated man myself, I adopted some little tactics of my own along this line: I go up and down the rivers, on the higher land adjacent to the rivers. In the latter part of August each year there is a dry spell; you will find that the grass will dry up for the want of water, and if you look out over the bottoms, you will see a spot which has dried up more than the others and, in most cases, that is because there is sand and gravel underneath there.

The Prospecting Outfit

You take along a couple of men with a post auger that you can bore a hole with. You can bore down to water. You will locate what appeals to you as being something worth investigating. Get an option on the ground or a lease, then when you want to make your real investigation, get one of these little clamshells that opens up about this wide (indicating); they are usually orange peel buckets, about 10 or 15 in. spread. Take some of the extra heavy black iron pipe; mine is 18 in., I think, for the first section; the ends are threaded so that when they screw together it is perfectly smooth inside and outside; about 6 ft. lengths.

You start one of these pieces down; put your little clamshell inside; and go on taking out the stuff as your pipe goes down. When you have gotten down as far as that piece of pipe will go easily, because of the friction on the outer side, take another piece of pipe, say 16 in., that will go inside of that. I have gone down as much as 62 ft. that way, with 20 ft. of that above water, making 42 ft. below water.

As you lift it out and put it in the wheelbarrow and dump it along in a row, you can know what is down there in each different space, say in each yard or each foot or whatever way you want to measure.

I think that is what the uneducated fellows want to know, how to find the right

spot without going out and setting a plant where there isn't anything to wash.

We got fooled once. We built a plant on the river. We operated six weeks; the river got up and formed a pile of driftwood and when the river went down it went down about 600 or 800 ft. from our plant. But you expect that kind of conditions on most any business, no matter how careful you may be.

On the Rim of an Old Lake

The last place we located, we used some of the geologist's ideas and what information we could get. We determined there was something in the nature of the leavings of a small chunk of ice that had broken off of some of the big glaciers and moved down, and by this system of prospecting we found a place that appeared to be the rim of some prehistoric lake, that had been afterwards covered up and that now the river cuts through.

We traced it and found where the river cuts through; this rim runs along the inside and then cuts back out, and we have specimens of every different stone there I ever saw anywhere in the United States or Canada; have all different kinds of granite, lime and quartzite. The largest pieces we have taken out will square about 100 cu. ft. from there on down to sand.

It did not take us long, of course, to get an outline of it, after we got the spot picked out, by simply going around with an auger and picking it out of the ground. We struck it from 3 to 10 or 12 ft. deep. We are attempting to work only the part in the riverbed, not the part out in the soil. I can readily understand how, if a man has a good college professor by his side to go along and point out the land, he will know where to stick his auger and look for it, while I had to travel up and down a good deal before I got my auger located on the right spot. But I believe we will accomplish a great deal in the industry by being more particular before we undertake to put in a plant and knowing that we have the stuff there.

Testing for Clay in the Water

PROFESSOR DAKE: I would like to ask the gentleman who has just spoken one question: The question was brought up to me by one of the men on the Missouri highway commission, in connection with sampling certain gravel deposits; that is the question of whether bringing up samples through a good many feet of water, the dragging of that gravel up through the water, washes out enough mud from it so that the sample, when you get it, is not characteristic of the composition of the bar.

MR. SNODDY: We had that same thought and the way we determined, we dug a hole that was 25 ft. below the water. We knew that we had brought up everything that was inside of that area, covered by the pipe which was 18 in. in diameter. We had not obtained anything but what was in that area, so what we did was to take a piece of tarpaulin and put it on a hoop with the hoop the size of the pipe, and put it down to the bottom.

First, we stirred the water so that everything in the nature of clay would be stirred up in the water. We then lowered this sack to the bottom and went away and let it settle for a day or two until it was clear, then we fished it out again. If there was anything that we did not bring out with our bucket, we had it in the sack.

We took this, dried it out and weighed it

R. Snoddy

and measured it and figured the percentage of that type of material as compared to the whole, and we found there was about ¼ of 1% left that the little bucket did not bring out.

MR. HAMILTON: I would like to say that the gentleman has given us some information that we spent several hundred dollars for that did not do us any good. In fact, we had several engineers utterly fail to penetrate our sand bed. I would say that we have about 500 acres that Major Betts tells us has been sounded to 28 ft., but our engineers failed to get through. The water surging up in the hole baffled them in every attempt they made to tell us what was down there 28 ft.

I would like to get the name of the instrument that is used and who manufactures it, that this test may be made. I would like to know whether our bed is 28 ft. or 200 ft. or what it is. We have an immense bed and I would like to know how to get down into it and be sure we are right.

MR. SNODDY: The Hayward bucket people make these little orange peel buckets; they make them any size you want. The size you should get is, when it is open to its full width, 12 in., I think; when closed, it is only about 9 in. That makes it a little slow about working in an 18-in. pipe, but enables you to put down an 18-in. pipe, and when you have that down as far as possible, you can put in a 12-in. pipe. If you know you are going down 60 to 100 ft. it would pay you to have two buckets.

In putting these down, if you get on top of a boulder and it won't come through the pipe, you can put a piece of dynamite down, pull up pipe and turn it loose; you burst up the boulder and you can proceed to dig.

Arkansas Gravel Plant to Be Enlarged

IMPROVEMENTS to cost approximately $20,000 will be made at once on the local plant of the Pine Bluff Sand and Gravel Co. at Pine Bluff, Ark. The improvements will include new machinery that will increase the capacity to about double the present output of the plant. The derrick will be rebuilt to be used in unloading barges. A storage base will be secured to take care of the business during high water on the river. A concrete driveway will be constructed to make the sand and gravel piles accessible. at all times.—*Little Rock, Ark., Gazette.*

Officers of Texas Calcium Arsenate and Lime Company

APPLICATION for a charter has been filed in the office of the secretary of state by the Texas Calcium Arsenate and Lime Co., with a capital stock of $600,000, and offices at Waco, Tex. S. C. Williams of Bryan is the president of the company, with John L. Spurlin, Sr., Waco, vice-president, and W. V. Hanover, of McGregor, treasurer. Other than the officers of the company, the following are interested in the enterprise: Paul Garrett and C. P. Schaffer, McGregor; J. P. Philp, Beaumont; P. C. Wilie, Dallas; W. M. Montgomery, Shreveport; L. W. Hagg, New York, and R. H. Threet, South Bosque.

Waco will be the distribution center for the company and offices are maintained in the Amicable building.—*Waco, Tex., Times-Herald.*

Anhydrite Study Urged by Gypsum Industry

INDUSTRIES representing more than 90% of the gypsum producers recently adopted a unanimous resolution urging the Interior Department, through the Bureau of Mines, to undertake work on the utilization of anhydrite. Some preparatory work along this line has been performed at the Non-Metallic Mineral Experiment Station of the Bureau of Mines, New Brunswick, N. J., and laboratory work will be begun in the near future.

The Railroads and the Requirements of the Industry

Address by W. J. McGarry
Chief of Open Top Car Section, Car Service Division, American Railway Association

IT is, in my judgment, eminently fitting, in view of the meeting of your association following so closely after the end of the calendar year 1923, that we review the performance by the railroads as a whole during the year, and this I will undertake to do, with no more prejudice than is to be expected from one who has supreme confidence in the ability of the railroads under private ownership and management, freed from unnecessary and restrictive legislation, to satisfactorily meet all of the commercial requirements of the country.

It is a fact well known that during the year just past the railroads have been very much in the limelight; on the one hand attacked by those seeking political advantage and the development of their own selfish interests, and on the other with their problems entirely solved by economic theorists who have had no more experience in railroad management and responsibility than the presentation of irresponsible and extravagant statements without any foundation on fact.

The adequacy of the transportation service furnished by the railroads during the year has been accorded such general recognition by the country at large that time will not be taken to do more than to set forth the high spots in an achievement that exceeds, in my judgment, by a good margin, all previous performances by the railroads during the 30 years I have been engaged in railroad service.

Conditions in 1922

It is admittedly a fact that during the latter portion of the year 1922 transportation conditions were not very favorable, due to the nation-wide strike of the railroad shop crafts on July 1, and the situation was made no better by the fact that when the production of coal was resumed on September 1, following the suspension of coal mining in the union fields on April 1, the railroads were called upon to provide equipment for and to handle a very large volume of coal traffic that should have been spread over the entire summer. At the same time there was an increased movement of general traffic.

During the early part of 1923 every indication pointed to a tremendous increase in the traffic the railroads would be called upon to handle during the year and the program to which the railroad executives pledged themselves in April is a matter of history. How well the pledge thus given to the public has been fulfilled is also a matter of history.

Capital expenditures made by Class 1 railroads during the year 1923 for equipment and other facilities in order to meet increased demands for transportation were the greatest for any similar period in history. Capital expenditures actually made in 1923 for the purchase of equipment and other facilities totaled $1,075,897,940, while unexpended authorizations made during the year but which have been carried over into the current year totaled $300,806,519. Included in the total expenditures made in 1923 was $690,857,266 for equipment, with $385,040,674 additional for roadway and structures which includes additional track, heavier rail, additional ballast, shops and engine houses and other improvements.

W. J. McGarry

Big Sums Spent in 1923

The actual expenditures for locomotives in 1923 amounted to $212,225,204; for freight cars, $415,923,534, and for passenger cars, $49,791,516. For other rolling stock and floating equipment, the expenditures totaled $12,917,012. Class 1 carriers also spent $116,215,710 for additional track and track material during the year, and $27,106,021 for heavier rail. Additional ballast cost $10,015,601, while expenditures for shops and engine houses, including machinery and tools, totaled $48,787,828. For other improvements not previously enumerated, $182,915,514 was expended.

Of the $300,806,519 unexpended authorizations which were carried over into 1924, $89,828,105 was for equipment, including a carry-over for locomotives of $20,665,383; for freight cars of $50,006,942; for passenger cars of $14,793,182. Unexpended authorization for roadway and structures carried over into 1924 total $210,978,414, including $64,843,315 for track, and track material; $19,169,551 for shops and engine houses; $4,132,463 for heavier rail, and $4,109,155 for additional ballast. The carry-over for other improvements amounted to $118,723,930.

Prosperity Reflected in Other Industries

It is perfectly obvious that $1,075,897,940 for capital expenditures in addition to the tremendous sum of practically $5,000,000,000 expended for operation, maintenance, etc., which is by far the greatest sum ever expended by the railroads in any one year, could not help but reflect prosperity in almost every other line of industry.

One result of the enormous expenditure was that the railroads handled, without transportation difficulties, the greatest freight traffic on record. Reports recently completed show that revenue cars loaded during the year 1923 totaled $49,814,970, exceeding by 4,696,498 cars or 10.4% the previous record freight traffic, which was during the year 1920.

Compared with 1922, the number of cars loaded with revenue traffic was an increase of 6,607,409 cars or 15.3%, and as compared with 1921 it was an increase of 10,491,812 cars or 26.7%.

It is of special interest that the loading of commodities which usually are handled in open top cars for the year 1923 totaled 19,907,297 cars, including:

Coal	11,347,539
Sand, stone and gravel	2,062,355
Ore	1,783,288
Iron and steel	1,580,633
Coke	717,762
Limestone	540,365
Miscellaneous	1,875,355

Information to enable a comparison with the years 1920 and 1922 is not available, but as compared with the year 1921, the increase in the loading of the commodities enumerated was 5,680,795 cars or 39.9%.

Increase Over 1921 in 1923

The increase in the loading in 1923 as compared with 1921 separated by commodities shows:

	Cars	Per cent
Coal	1,958,747	20.9
Ore	1,081,891	154.2
Sand, stone and gravel	812,401	65.0
Iron and steel	805,662	104.0
Coke	405,612	129.9
Limestone	225,566	71.7
Miscellaneous	390,916	26.3

"Loaded car miles" for the first 10 months of 1923, which includes the latest

figures available, reached a total of 13,784,755,000, an increase of 2,414,710,000, or 21.2%, over 1922; 3,318,124,000, or 31.7%, over 1921, and 783,269,000, or 6.1% over 1920 for the same period.

"Net ton miles" for the first 10 months of 1923 reached a total of 386,018,000, an increase of 84,486,000, or 28.0%, over 1922; 96,045,000, or 33.1%, over 1921, and 8,993,000, or 2.4%, over 1920 for the same period.

"Revenue cars loaded" is an index or barometer which is quickly available to indicate the trend of business conditions and is generally so recognized.

"Loaded car miles" taken alone ignores length of haul, increased capacity of car and increased loading per car.

Loaded Car Miles

With the increase in population and the natural expansion in production, industries are locating in close proximity to the consuming markets, which has the effect of reducing the average haul per loaded car; at the same time, there is an increase in the "revenue cars loaded." As an instance of this, at a recent meeting of the Ohio Valley Shippers' Regional Advisory Board, held at Cincinnati, one industry reported that, notwithstanding a very material increase in production, the length of haul on its commodity had been reduced in recent years approximately 50%. The fluctuation in markets also has a material effect on "loaded car miles."

During the World War, with a considerable portion of the production, including grain, moving long distances by rail to the seaboard, it was a natural consequence that the average haul per loaded car should be greater than during periods when the consumption is in domestic markets.

"Net ton miles" is also subject to influence by the average haul per loaded car and to fluctuations in commodity loading. For instance, during 1923, certain commodities which produce a high average loading per car not only did not show an increase in the loading in proportion to the increase in the total loading of all commodities, but in some instances, notably that of coal, there was an actual decrease in the number of cars loaded, at the same time there was a tremendous increase in the loading of other commodities which produce a comparatively low average loading per car.

Any conclusions with respect to transportation, which fail to take into account these varying conditions which have such vital bearing on the results, are inaccurate and, therefore, misleading. That the tremendous volume of tonnage originated during 1923 was handled expeditiously and with an absolute freedom from congestion, and with practically no car shortage except in spots and for comparatively short periods, argues well for the future, providing the railroads are given the opportunity to work out their own salvation and are permitted to earn a fair and reasonable return for the service rendered, so as to make possible the continuation and extension of the program adopted by the executives in 1923.

In dealing specifically with the open top car supply, it is entirely within the bounds of safety to venture the statement that the requirements for the loading of sand and gravel were protected as never before during any similar period of business activity.

The Car Service Division found it necessary to a proper relocation of equipment during 1923 to issue orders C-390 and C-391, which required other lines to return to the home lines in empty movement open top cars belonging to the Chicago & Eastern Illinois, Chesapeake & Ohio, Illinois Central, Louisville & Nashville and Norfolk & Western railroads. These were two of the most drastic orders ever issued from any central authority and the extent to which the orders were enforced by the individual carriers represents one of the most remarkable performances of record. There was some complaint from shippers of sand and gravel in certain territories against the provisions of the orders, but investigations developed that the complaints were based more on apprehension than on actual shortage created as a result of the orders and the complaints so registered were straightened out without delay to the mutual satisfaction of the interested parties.

In an article appearing in the National Sand and Gravel Bulletin issue of December 15, 1923, it was made to appear that—as a result of orders issued by the Car Service Division, referring presumably to orders C-390 and C-391 previously mentioned—there was a shortage of cars created for the loading of sand and gravel. Providing that article states the facts correctly, no such conditions were brought to the attention of the Car Service Division by the representatives of your association in Washington.

More Scared Than Hurt

It is a fact, as before stated, that some complaints were registered, but it was developed through investigations, made on the ground, that the complaints were anticipatory rather than actual, and that up to the time the complaints were filed the complainants were and had been receiving an adequate car supply.

It is an obligation of the Car Service Division to see that cars are distributed equitably among the carriers, on the basis of ownership by each road, so as to avoid car shortage, and in the event of a car shortage developing on the rails of any one or more carriers, to take action to afford the necessary relief. It should not require any argument to convince the members of your association that these shortages, when they develop, can best be relieved, and with the least disturbance to business conditions, by requiring the return to the home lines in empty movement of the system cars of the roads involved. From the standpoint of the sand and gravel producers, this action should be decidedly more desirable than would be the issuance by the Interstate Commerce Commission of service orders under the powers granted to it in the Transportation Act of 1920.

The present code of car service rules, based on ownership principles, with flexibility, prescribe the only practicable and most economical way in which open top cars may be handled. It is estimated that because of unbalanced loaded traffic, between 35% and 40% of the mileage made by open top cars is in empty movement and it is not conceivable how under any plan which makes due provision for the return of cars from the consuming to the producing territory any saving in empty mileage is possible. It should be apparent that when there is a regular and orderly movement of cars returning empty from points of unloading via the same route the loaded movement has traveled, there is immediately available, as a general rule, the motive power which handled the cars on the loaded movement and which avoids the necessity for creating light engine mileage at additional expense. These conclusions are sound in principle and are concurred in universally.

What Controls Mileage Ratio

To any one who has made a study of the subject, it is readily apparent that the ratio of empty car mileage to the total freight car mileage is controlled to a very large extent by the spread between the loaded car mileage East and North as compared with the loaded car mileage West and South, due to conditions of unbalanced loaded traffic, and by the percentage heavy loading commodities bears to the total loading of all commodities.

When there is a falling off in the Westbound loaded movement, there is an immediate increase in the ratio of empty car mileage, and the same holds true when the percentage of heavy loading commodities, usually handled in open top cars, increases out of proportion to the increase in the loading of commodities handled in box cars. In either case, it is beyond control under any plan of car distribution so long as the necessity exists for the return empty movement of box cars in volume to southern and western territory, and for the return empty movement of open top cars to the mines and other producing territories requiring the use of such cars.

A study of statistics covering "car shortage" and "car surplus" for the three months, August to October, inclusive, 1923, as compared with the same period in 1920, when business conditions were very similar, reveals some interesting data:

During the three months period of 1920, the "car shortage" covering all types of cars ranged from 66,000 to 131,000 cars per day, with practically no "car surplus." During the same period of 1923, there was practically no "car shortage," but on the contrary there was a "car surplus" ranging

from 27,000 to 73,000 cars per day, indicating a complete reversal from the conditions which obtained in 1920.

There is one subject of special interest to the members of your association, on which I desire to dwell, and that is the provision in the care demurrage rule, which provides that "empty cars placed for loading coal at coal mines, coal mine sidings, coal washers, or coke at coke ovens and such cars under load with coal at such mines, mine sidings or coal washers or coke at coke ovens" are exempt from demurrage.

It is not a function of the Car Service Division to formulate car demurrage regulations, as that is a matter which properly belongs with the committee on demurrage and storage of the association, but we are directly interested from the standpoint of car efficiency.

I have not discussed the subject with the other members of the division and, for that reason, the views which I express are individual and should be so accepted.

Sand and gravel does not enter into competition with coal, *except in the matter of car supply.*

It has been contended that, under the present demurrage regulations which permit the holding of empties, part-loads and unbilled loads at mines and on mine sidings free of demurrage, the coal industry absorbs a greater portion of the car supply than otherwise would be the case. But whether these conclusions are correct is, in my opinion, open to serious question.

Distribution of Cars to Mines

The distribution of cars to mines for coal loading is governed by "mine rating and car distribution rules," which provide that empties, part-loads and unbilled loads held at mines or on mine sidings will, during times of car shortage, be charged against the mine's pro rata share of equipment available for distribution.

Providing the exemption carried in the present car demurrage rules was eliminated and demurrage charged against cars so held, recourse would, no doubt, be had to the "average agreement" under which credits accruing on cars loaded and billed out currently could be applied to offset the debits on cars held over, with no material change in that respect from the conditions which have obtained up to the present time.

It would also, no doubt, be contended that a further penalty should not be imposed by counting "hold-overs" against the mine's pro rata share of equipment available for distribution and which would have the effect, providing the contention was sustained, of cancelling that provision in the present mine rating and car distribution rules, with the result that the mine would be entitled to order, if it so elected, its full rating, without regard to the number of "unbilled" loads which it was carrying.

Whether the sand and gravel industry is entitled to the same exemption is a matter on which I have formed no definite conclusions, because of the little knowledge which I have of the conditions surrounding production.

Probably the best answer to the problem I can give is to venture the prediction that unless there is radical interference by Congress in the matter of freight rates, which will force a curtailment of the railroad program or the transportation machine is seriously crippled by labor disturbances, a shortage of open top cars for any loading is very unlikely for the period of the next five years at least.

Equitable National Car Demurrage Rules Necessary

By T. E. McGrath
McGrath Sand and Gravel Co.

IT is gratifying to hear from Mr. McGarry and know that the railroads' proposed program, if it is carried out, assures the sand and gravel men an adequate car supply for the next five years.

Along that line, I would like to say that it is time for the public, especially the shippers, to form a friendly alliance with the carriers, to the end that no unfavorable legislation will be enacted to prevent them from going ahead with a program that means so much to the sand gravel industry.

I agree with Mr. McGarry that the sand and gravel industry of Illinois—and I can speak only for Illinois—received practically 100% car supply during the season of 1923. I believe that the year of 1924 holds as much for the sand and gravel people as we had in 1923.

I cannot agree with Mr. McGarry, however, on the fact that the sand and gravel men are not in direct competition for open top cars with the coal operators, and it has been my observation that the railroad world has not thoroughly acquainted itself with the importance of sand and gravel shipments.

If the report that Mr. Barrows, our efficient secretary has made, is correct, that sand and gravel and stone shipments create one-sixth of all of the revenue that the railroads receive during the year, it seems to me that the railroads then should co-operate or give us the same co-operation that they give the coal operators.

It is true that we do not object to the demurrage basis on which we now operate, but is there any reason why the coal operators should be put on a more favorable basis? I say there is no equitable reason why it should be.

Our operating conditions are similar to the operating conditions of the coal operators. We both have surplus material to move, practically every day in the year, regardless of whether we have our order books full of orders or whether we are out selling, from day to day, our output.

Now, what advantage does that give to the coal operator? Generally, the rating he has is greatly in excess of his ability to load coal, probably 50 to 60%. If he has this advantage, it takes away from the sand and gravel operators cars that ought to be in service, and enables the coal operators to market their coal on a more favorable basis, because they can permit this surplus material to stand on the track longer and this gives them that much more time to dispose of their surplus material.

An argument Chairman Crawford, of the American Railway Association, made, was that the sand and gravel industry was not a staple commodity, in other words, it was highly specialized, and that is why I say that the railroad officials should get acquainted with the sand and gravel industry. There is a movement of sand and gravel practically throughout the entire shipping season, and I think it is as much a staple commodity as coal.

It is true that the average agreement or contract with the railroads under which most sand and gravel men operate is very satisfactory. We are not asking to be exempt from paying demurrage on cars, but we do ask and we feel we are right in asking it, that demurrage be applied alike to sand, gravel, stone and coal.

There is quite a diversity of opinion, I understand, among us, the operators, as to whether or not we desire to be put on the same basis with coal, as to the capacity rating feature. If the information I have is correct, the carriers in several states now rate the capacity of gravel plants the same as the coal mines are rated. I understand in those states that the carriers are as fair and liberal in their rating of gravel plants as they are in the rating of coal plants.

I do not know that there is a great deal more to say about it. We are all familiar with the demurrage rules, and I believe that every gravel operator feels that the demurrage rules should be applied alike, and that the discrimination should be removed.

I would like to add a few words in regard to reconsigning. Sand and gravel is more sensitive to freight rates and demurrage charges than any other commodity, because it is a low priced commodity. Now the railroads put us on an equal basis with coal,

on reconsigning, and I know in our experience that it has worked a hardship. They charge $6.30 for reconsigning a carload of gravel, which will sell possibly for $30 to $40, the same charge that is made for a car of coal that will sell for about $200.

Now, if it is fair to put us on the same basis on all other transportation rules, then why isn't it fair that coal should be on the same demurrage basis as we are? There is no just argument against it.

Sand Men Are Good Natured

There was one speaker this morning, who said something that appealed to me. He said we were too good natured about a good many things that are of vital importance to us, and I would like to see this body go on record to carry this matter to the carriers in such a way that we can work out a friendly basis and see if we cannot bring coal up or down to the same demurrage basis that we are now operating on and carry it out.

Our Illinois Association has taken action before the Illinois Freight Committee and the Central Freight Association on that reconsigning order. We believe that the reconsigning of sand and gravel should be brought back to the basis of $2 per car, and owing to the fact that we are a low priced commodity, we are entitled to that. Now, it is doubtful as to whether or not the other high priced commodities are entitled to as low a basis as we are.

Discussion

MR. BRADLEY: Mr. Chairman, as I understand it, the reconsigning rules apply the same to sand and gravel as to coal. Now, if you give your reconsigning order before the car arrives, I forget what the charge is, but it is less than $6.30. But if you allow the car to arrive in the yard and then give the reconsignment, then it is the same for coal, at least in our territory. I do not exactly understand the argument. Reconsignment is a service the railroads render and I do not see how the value of the commodity would enter into it. A car arrives at the terminal and it is reconsigned after it arrives; then there is a certain amount of service the railroad renders in taking care of that reconsignment.

MR. McGRATH: My argument is if they put us on the same reconsigning basis, then they should put the coal people up to the same demurrage basis. I further say that the charge they make of $6.30 is too high for reconsigning sand and gravel. I know our state association is going to try to get the carriers in Illinois to reduce, and I really believe if it is brought to the proper attention of the American Railway Association that ultimately we will be able to interest the officials of that association to reduce it.

MR. BOND: That is the very point to be discussed. The railroad company charges according to the value of the stuff they haul. If that rule holds good, more for corn and less for wheat, I see no reason in the world that we, as a sand and gravel association, should not get the benefit of lower rates.

MR. HAMILTON: I would like to say from my observation of all the coal companies that I have seen loading, that it takes from 24 to 48 hr. for them to load after the cars were set in. I could not say as to the promptness of the other sand and gravel men of this country, but I will say that in 500 cars that were loaded on our sidetrack, there was never a car lay there as long as 5 hr. That shows the promptness with which our material is loaded, and I think most of the sand and gravel operators have as good or better records than we have. So why should we be discriminated against on the other end of the line, when the loading is in the railroads' favor, as far as the loading of sand and gravel is concerned.

CHAIRMAN DANN: For the information of those who have not followed it, the National Association has been trying to prosecute the matter of getting the demurrage rates on coal and on sand and gravel adjusted, so they will be the same. There is no dissenting voice on that; no one has expressed any opinion otherwise, therefore, the National Association will continue its efforts, through the committee which has been appointed, to try to equalize the demurrage charge.

Combination of Rochester, N.Y., Sand and Gravel Producers

PAPERS have been signed for the purchase of the entire plant, equipment, and sand and gravel deposits of the Continental Products Corp. by the Consolidated Materials Corp. The Continental was the largest company supplying washed sand and gravel for concrete construction work in this section of the state, and its purchase is in accord with the announced plans of the Consolidated Materials Corp. to consolidate a number of independent companies into one giant corporation with an annual output of a million tons of sand and gravel.

The purchase includes about 300 acres of deposits of sand and gravel on three railway lines. It also gives to the Consolidated Materials Corp. the Continental's Lehigh Valley Railroad terminal at Mt. Hope avenue. From this city distribution point quick truck deliveries of the finished raw materials can be made to construction jobs. The immediate installation of a new electric shovel will raise the daily output of the Consolidated Materials' newly acquired plant alone to an average of around 1500 tons.

The officers and directors of the Consolidated Materials Corp. are: Chairman of the board, Charles D. Newton, formerly attorney-general; president, William H. Craig, president of the Willite Corp. of Rochester; vice-president, Judson H. Webster, retired; secretary and treasurer, George I. Viall of George I. Viall & Sons of Rochester, and the following directors: James F. Hamilton, president of the New York State Railways, and E. W. Foley, president of the E. W. Foley Construction Co. of New York City and Waterloo, N. Y.—*Rochester, N. Y., Times-Union.*

Florida to Spend Large Sums on State Highways

OVER $750,000 will be spent on state road No. 4, the Waycross road, as a result of contracts let recently by the Florida state road department totalling $1,891,559.04. Upon completion of the work in Nassau, Brevard and Volusia counties on road No. 4, there will be established for the first time a splendid hard-surfaced Dixie Highway from the Georgia state line to Miami.

The three projects which comprise a portion of the Waycross road will cost $755,840.48 and will repair links in this important thoroughfare in Nassau, Brevard and Volusia where work is badly needed. In Nassau county a contract was let for 12 miles of roadway between a point five miles north of Callahan and St. Mary's river. This road will be rock base and surface treatment, using reinforced concrete for larger drainage structures. The amount was $277,846,33.

Project 40-E, Brevard county, provides for 13.59 miles of road from Titusville to the Volusia county line, which will be built at a cost of $285,562.08. This contract calls for the clearing, grubbing, grading, drainage structure and rock base of this road.

Project 604, Volusia county, provides for the conclusion of 27.7 miles between New Smyrna and Rose Bay. This contract calls for clearing, grubbing, drainage structure and rock base. The amount was $191,432.07.

Iowa Gravel and Tile Company to Build Washing Plant

PLANS are now being completed for the addition of a washing and screening system and a cement products plant to the Waverly Gravel and Tile Co.'s property near Shell Rock, Iowa. This improvement will keep the company's labor organization employed all the year instead of from six to seven months as has been the case heretofore.

The Waverly Gravel and Tile Co. owns more than 90 acres of land which is underlaid with a clean gravel and sand running to a proven depth of 73.5 feet. This, it is said, is not the bottom of the deposit.

The value of the company's improvements on the property, according to a recent appraisement, is $26,845.07. "These improvements," said W. M. Brooks, an officer of the company, "have all been made out of the earnings of the company accruing from the operation of the plant in the past." He stated that the demand for the products of the plant are increasing every year.

New articles of incorporation with an increase in the capital stock have been adopted, Mr. Brooks said.—*Waverly, Iowa, Independent-Republican.*

Washed Gravel as Railroad Ballast

By Earl Zimmerman
Of the Ohio Ballast Co.

WE have gravel plants located on the Big Four, B. & O., Pennsylvania and Norfolk & Western railroads. We furnish these railroads washed gravel for ballast. We also furnish to the L. & N. Railroad Co. and the C. & O. In every case, the specifications for washed gravel ballast are much the same. These roads have defined gravel and sand for us. Gravel is 2½-in. to 1/10-in. and passing the 1/10-in. and retained on a 50-mesh screen is sand. That material which would pass the 50-mesh is classified by the railroads as dirt, dust or loam, and must, of course, be kept out of the ballast.

Earl Zimmerman

We manufacture this ballast by making the separation of 2½-in. to 1/10-in. material, and then add back to the gravel 20 to 25% of material passing a 1/10-in. mesh and retained on a 50-mesh screen, this being the percentage of sand which they permit.

Inspection

We are governed by a daily inspection of every few cars loaded. The railroads inspect the ballast and make a test to see that it is properly prepared to their specifications and that it conforms, too, to the A. R. A. Engineers' Specifications.

Gravel ballast being manufactured with the process under control, means that it is practicable for the railroads, to use a washed gravel ballast. I am not in a position to compare to any great extent washed gravel with any other ballast except crushed stone. In addition to the crushed stone ballast, there are sections that use slag, cinders, cherts and other materials. I do not know anything about the other kinds of ballast than stone and gravel, but I do know that washed gravel compared with stone is very much more economical, and if made strictly according to this or some specification that would take the dirt out, it in length of life and wearing quality would be the equal of stone or any ballast that is being produced, because there are only two things to be considered in ballast. First, a selected material for a road bed that will hold a railroad track in line and surface; second, a material that will provide good drainage. If gravel is properly prepared, it would cost, I should say, only half of the cost of crushed stone.

Gravel and Other Ballast

I have made some investigation along the line of comparing the two as to costs to the railroads, and I think I may state here, without being criticized for doing so, that the B. & O. railroad on their line from Cincinnati to St. Louis have in years past been maintaining their railroad on stone ballast, but last year, 1923, they began a program to change to washed gravel for railroad ballast. The Ohio Gravel Ballast Co. is going to furnish the gravel.

We are glad to see them make the change, but we asked them why they did it, and they have said there were three reasons: First, that washed gravel ballast, at the point of origin, is materially cheaper; transportation is the same, deposited on the track. Second, the labor of applying gravel after it is unloaded is less than that of applying stone. In our section, I know that track laborers make more money from the railroad for working stone ballast than they do for gravel. Not nearly so many feet of track can be properly stone ballasted in a day as can be done with gravel, on account of gravel being easy to handle with ordinary tools, whereas stone is very hard to place and requires special tools to apply.

The third reason, and I mention this not alone from my own experience but quote from railroad authority, is that on a railroad ballasted with washed gravel, which is easy to handle, it only requires about a third as much labor for maintenance as it does for stone.

I have made a further investigation on some of the principal railroads as to the life of gravel ballast compared to stone. I have been told that the life of crushed stone ballast is eight years, that the life of a properly manufactured gravel ballast is eight years. So we have no difference in the life. At the end of eight years, it is necessary to clean stone from dirt that works up from the subgrade. This is done by a very expensive forking method and it is necessary in cleaning stone to waste a

Loading side of Cleves plant of Ohio Gravel Ballast Co.

Cleves plant railroad yards

Steam shovel loading ballast material for washing

large part of it, requiring further applications. The cost of cleaning this stone and adding additional stone would in every case amount to more per cubic yard than it would have cost to have cleaned out and put on an entire new application of gravel.

The one real objection that we have heard against washed gravel ballast (I will tell you what that is, just as I have told you the things in favor of it) is that if we did not remove from this prepared ballast all of the material (dust and dirt) that passes the 50-mesh, it might leave a dusty track, and a fast moving train would create a lot of dust by the suction from the rear cars. We have overcome that thing and I am satisfied that washed gravel ballast is getting a good foothold. I believe if it were properly explained, and honestly advertised, showing the advantage and economy in it, gravel ballast would be very largely used in the future.

It would seem to me the National Sand and Gravel Association (if other producers have the same conditions that we have in the Cincinnati territory and want to promote washed gravel for ballast) should have a ballast committee to work with the railroads. They, at any time, would give this committee an opportunity to talk with them about ballast and how it can be made. They have their own committees. The ballast committee of the American Railway Engineers' Association, who are the railway companies engineers, made these specifications and the principal railroads of the country have adopted not only their washed gravel specifications but those for stone, slag or other materials used for railroad ballast.

New Missouri Sand and Gravel Plant

THE Northeast Missouri Sand and Gravel Co., recently organized in this city, has about completed its big gravel plant, on the St. Louis & Hannibal railroad, 20 miles from Hannibal.

The new plant, will have a capacity of 20 car loads of sand and gravel per day. It is expected that it will be in operation within the next week.

Sand and gravel from the new plant is said by those who have seen it, to be of a splendid quality for road work. Later the company expects to erect a plant for loading sand and gravel to be used in concrete work.

The Northeast Missouri Sand and Gravel Co., is a Hannibal concern. Many members of the concern reside in Hannibal and vicinity, and its general offices will be located in this city, and the supplies used by the company will be purchased here.

The company has secured option on a considerable tract of land.—*Hannibal Mo. Post.*

$50,000 Suit Involving Silica Sand Deposit

SUPREME Court Justice Carswell has granted judgment in favor of George D. Pratt, the oil magnate, against Miss Mary W. F. Spears, and the Spears and Clay Works, of 243 Madison avenue. Manhattan, in his suit to recover $50,000, which he invested in bonds of the company.

The corporation bought a large tract of land at Earleigh Heights, Md., which was claimed to be rich in sand deposits, to be used in making glass. There was a mortgage on it for $29,000.

It was claimed that in July, 1922, Mrs. George D. Pratt was introduced to Miss Spears by the late Mrs. Mabel T. S. Falco and at that time Miss Spears sought to interest Mrs. Pratt in the stock of the company. Later on, it appeared that Mr. Pratt was approached in regard to sale of the stock and took $50,000 on the condition that he be made a director and that the mortgage on the property be paid.

It was further alleged that Mr. Pratt was paid interest on his bonds out of the money which he, himself, had invested in the company, and that this fact was concealed from him. Justice Carswell held that this was illegal and that Pratt must have his money back.—*Brooklyn, N. Y., Times.*

New Ohio Sand Company Buys Tract

A 52-acre tract of land lying off the Cincinnati pike near the Miller's Ford plant of the Dayton Power and Light Co., has been purchased by the Moraine Sand Co.

The purchase price was $35,000. According to C. L. Van Dyne, president and treasurer of the newly formed company, the sand necessary for the manufacture of its product will be taken from this land. The firm will specialize in the making of plaster brick, asphalt brick and other products essential for building purposes.

Officers of the company are, C. L. Van Dyne, president and treasurer; V. C. Conrad, vice-president and general manager, and F. B. McKinney, secretary.

Operations at the pit should begin in a few days.—*Dayton (Ohio) News.*

Open Forum: Discussion of Various Methods of Transportation

Standard Gage Equipment, Gasoline Locomotives and Small Cars, Cableway Draglines, River Barges and Pipe Lines

Transporting with Standard Gage Equipment

By DAVID ALEXANDER
Dixie Sand and Gravel Co.

TO begin with, I am frank to say that I am not in a position to compare the advantage of using standard gauge locomotives and large cars with other methods of getting material to the plant, because ever since we have been in business, eight years ago, we have been using standard gauge locomotives and 40, 50 and 57½-ton railroad cars for hauling material from our dragline to our hopper.

We use a Bucyrus dragline with a 2-yd. bucket, a 31-ton Vulcan locomotive, and when we first started, we used 40-ton

David Alexander

railroad cars, which we have later supplemented with 50 and 57½-ton cars. With an expenditure of approximately $20 a day, we are able to deliver at around 2000 tons a day at the hopper. A great many days we do not do that, for the simple reason that we are not in a position to take care of it at the plant. Our haul varies from 200 yd. to a half-mile, and I believe a standard gauge locomotive and a large railroad car, where possible to be used, is a cheap method of getting material to the plant, as cheap as it is possible to get.

CHAIRMAN DANN: Before we proceed further with the formal part of the open forum, I would like to repeat the remarks that I made in the beginning, that is to the effect that these open forum discussions are for the purpose of information. One individual producer may have a condition which is applicable, with some changes, to the conditions in other production plants, and this open forum is for the purpose of spreading information among the members, it is for the purpose of promoting discussion, and while we will go right on down through the papers listed on the program, at the end of it, we hope there will be a general asking of questions on the part of those interested and a general discussion.

Advantages of Gasoline Locomotives and Small-Unit Cars

By J. L. Shiely
Shiely Sand and Gravel Co., St. Paul, Minn.

IT may be said that there was a time in our business, not many years ago, and no doubt most of you present know this as well as I do, when the conveying of material from the pit to the plant did not enter into our problems to any great extent. If we did business on a small scale, our plant was placed close to the source of supply, necessitating only a belt or bucket conveyor to put the material into the plant, or a few 1-yd. dump cars with a horse or cable to pull them to the plant. But that time has passed and today most of us operate on such a large scale that we must give considerable thought to the problem of expeditiously and economically transporting the material to the plant. In fact, many problems enter into our business today that did not enter into it a few years ago.

We dig from old Mother Earth what is now quite generally considered an unfinished product for construction purposes, and when we have fully prepared it for the market, it is a finished product which has been through many processes of preparation. I want to show you that this supposedly simple problem of conveying the material is often times the stumbling block to the success of a business, and that this transportation if it is done with dependable machinery (assuring you a constant supply of material when needed in the plant) is a great aid to you as a business builder.

At our plant in St. Paul, we dispose of about 50% of our product locally to the building contractors, which is delivered by trucks; about 30% goes to local paving contractors, which is also delivered by trucks, and the balance of 20% is loaded into cars and shipped to p ints outside of St. Paul.

You will realize from this explanation of the division of our business that the demand is not constant and that we must be ready at all times to make quick deliveries of both large and small quantities of our product. We do not have large storage facilities to take care of all of this business so our entire plant must work constantly and without a hitch to enable us to take care of our customers at all times.

Gentlemen, you and I know of sand and gravel producers who have driven their customers to competitors because they could not furnish material when it was needed. The principal cause of this was plant breakdowns. If your digging and conveying plant consists of one large unit, your entire plant is shut down when your pit-to-plant handling machinery breaks down. We avoid delays of this kind by using a narrow-gage industrial railway, consisting of 3½-ton, 24-in.-gage gasoline locomotives; 2-yd. double side dump cars and 35-lb. rail upon wooden ties. We have an extra locomotive and some extra cars which we find add very little to our hauling cost and serve as good insurance against delays on account of breakdowns.

For handling material such as sand, gravel, rock, coal, etc., under conditions adapted to its use, the industrial railway has no equal

because its first cost, its maintenance cost and its operating cost is less than that of any other kind of material-handling equipment. Small-unit cars and gasoline locomotives, of course, have their limits of capacity beyond which it is necessary to use larger cars and locomotives. However, I believe that in the average plant operation, cars and locomotives larger than ours are not necessary and, if used, mean a larger investment and greater maintenance and operating costs than is necessary.

Excessive track gradients in a pit might eliminate the use of an industrial railway or small locomotives. In some cases a 7-ton geared type gasoline locomotive would be required to pull three or four 2-yd. cars and, of course, this would increase hauling costs, but in our pit we have no bad grades, so we handle four cars per train with ease with our 3½-ton locomotives.

During this year, we will build a larger plant requiring about 2000 yd. of material per 10-hr. day, and we will use 7-ton gasoline locomotives to pull 10-car trains. With our present plant, we operate about 200 days of 10 hr. each per year, and average 800 yd. of material per 10-hr. day. Our pit is rectangular in shape, about 600 ft. wide and 1400 ft. long. Our maximum haul in this pit is 1000 ft., but during 1922 we took our material from an adjoining pit which required a 3000-ft. haul. On this maximum haul, we used three locomotives and kept our plant going nicely.

Flexible Operation

An industrial railway is flexible. It permits changing your operations from one part of your pit to another at a minimum of expense. Merely pick up your track or skid it in sections with a team of horses to your new location and you are ready to go. Can you do that with any other kind of equipment?

Derailments of locomotives and cars are few when rail as heavy as 35-lb. is used and then the locomotive merely straddles the track and is easily replaced with track replacers or with a long beam used as a lever to lift the locomotive.

The gasoline locomotive of today is a simple and sturdy piece of machinery, and its operating and maintenance cost is low in comparison with that of steam locomotives. Its hauling capacity per ton of weight is about 50% greater than that of the steam railroad locomotive. In fact, I need not tell you of the many advantages of a high-grade gasoline engine over a steam engine in the smaller units, because most of you here know that from experience.

The last thought that came to me, as I prepared this paper, is the small cost for which we will more than double our hauling capacity to our new plant; merely an additional locomotive or two and a few extra cars—not even additional track. Understand, I am not recommending the equipment where grades are heavy, where material contains a volume of large boulders, where haul to plant exceeds three-fourths of a mile, where track shifting is not a factor (as in a high bank located over one-half mile away), where subgrade for track laying is such as to require too much maintenance, where a greater production than 200 cu. yd. an hour is needed, or where the haul is so short as to justify a cableway dragline, pump, or conveyor installation. I can also conceive of places where plant switching would be necessary and where it would be desirable to use pit equipment for this switching service.

I might say I was a steam locomotive man until I attended one of these conventions and got to talking with Mr. Carroll, from Buffalo, some five years ago, and Mr. Carroll told me that the gasoline locomotive was a very cheap operating machine.

I have also thought since listening to Mr. Alexander's remarks, that you might have a situation where you had large loading equipment that might be too large for the small cars, such as we use.

We do not have a single unit system limited as to capacity and length of haul to scrap or sell at a sacrifice. Could we double our hauling or conveying capacity so easily and with so little additional expense if we were using any other kind of equipment?

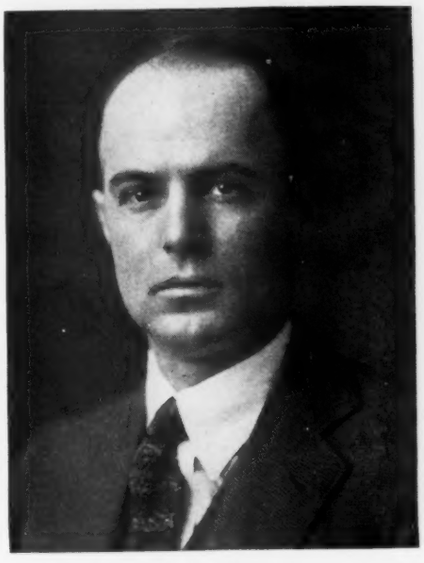
In conclusion, I might say that St. Paul has just passed through a great era of prosperity which probably will continue for the next two or three years. Our building permits this year were $36,000,000 and very little business building at that. St. Paul, this year, was the seventh in cities of the United States in point of building permits, and that does not include a $20,000,000 permit for the Ford Motor Car Co. Such a development of business meant that there were many months in which we opened up as high as 700 new accounts in one month. The fellow who wants to build his little garage or a driveway, or put a little curb around the house, has learned to do the work himself. I think he has learned it largely through the propaganda and the efforts of the American Portland Cement Association.

We have discovered that Saturday morning has turned out to be the biggest day of the week. A man comes home Saturday noon and he works Saturday afternoon and Sunday, around his house, and he wants a little "jag" of sand and gravel to do the work that he intends to do. We may be a little more fortunate in our state than in others, in that we have very fine lien laws and the producer need not worry about the collection of these small accounts, for they are all lienable if not paid within 90 days.

Conveying with Cableway Dragline Excavators

By C. H. Young
Robbins-Young Co., Minneapolis, Minn.

I OPERATE two dragline plants, one a 2-yd. unit and one a 1½-yd. unit. It has been my experience that if you have a deposit that is suitable for cableway dragline equipment that this method is by far the cheapest for handling sand and gravel.



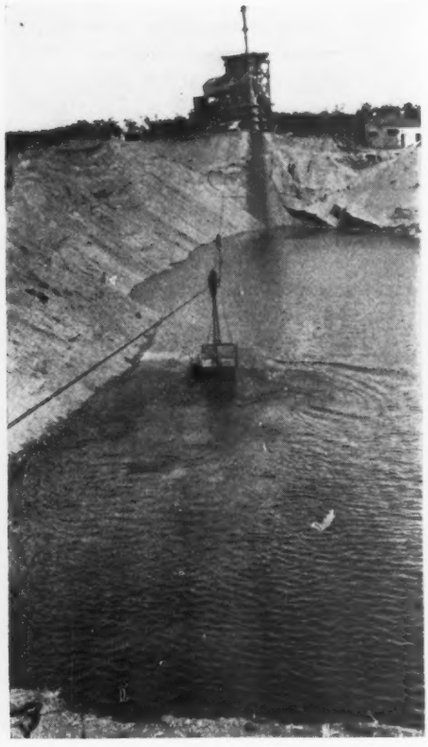
C. H. Young

In one of our units, a country plant, we have a 2-yd. bucket and a 150-hp. Thomas electric hoist, producing about 1000 yd. of material in 10 hr. We use six to eight men. We have a plant in town in which the 1½-yd. bucket is used; it requires about the same number of men and produces from 600 to 700 yd.

Our New London plant, which is our county plant, is ideally suited for a cableway dragline installation. We have 15 acres and our dragline will cover the entire acreage with a maximum span of 500 ft. We make a round trip with the bucket every minute and eight seconds. You must have the proper location in order to use the dragline successfully. It has been my experience that if you have the proper conditions, the use of a dragline is far cheaper than any other method of excavating and conveying. We have used steam shovels and pumps and we know that there are advantages to each of these, of course, in their natural places.

I would be willing to answer any questions I can on dragline work.

MR. BOND: I would like to ask the bucket used.



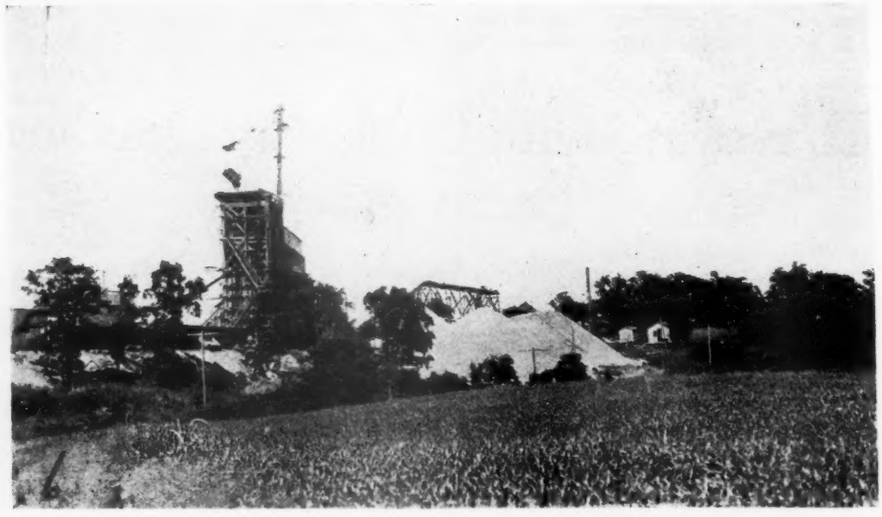
put up a mast separate from the plant. The life of your plant is decreased materially by having the mast on top of it.

Excavating and Conveying with Cableway Dragline

By J. A. SHEARER
Indiana Gravel Co., Indianapolis

I HAVE been assigned the subject, "Conveying with Cableway Dragline Excavators." It is difficult to differentiate between the excavating feature and the conveying feature of the cableway dragline excavator. I have been connected with the sand and gravel industry in Indianapolis for more than 25 years. In 1911, the first cableway dragline, or "slackline" as it is known locally in our vicinity, to be installed in the Central West, was installed at our gravel plant on White river in Indianapolis. The advantages of this method of excavation were at once apparent, as we were able to execavate to the entire depth of the deposit and convey it direct to the screening plant or receiving hopper in one cycle of operations. As a conveyor, the dragline cableway is a self-loading conveyor. The bucket runs out to the loading point by gravity and, after being lowered into the material, one continuous pull on the dragline loads the bucket, hauls it out and dumps it.

J. A. Shearer



Two views of the Robbins-Young plant. Note that the mast is not attached to bins

MR. YOUNG: Saurmann's.

MR. BOND: What is the cost per yard?

MR. YOUNG: It all depends upon conditions of production. We have had months that our cost would go as low as 14 cents a ton, and we have had months where our costs would go $6.50 a ton.

MR. BOND: Does that include depreciation on the plant, wear and tear, etc.?

MR. YOUNG: No, that is the actual cost of operation.

MR. HAMILTON: I would like to ask what power is preferable for draglines?

MR. YOUNG: We use electric power, and find it very satisfactory. I wish also to express my thought in regard to the placing of the mast. I would not recommend putting a mast on top of a plant. I would

At one of our plants, we crush all the oversize material and drop it back into the stream by gravity immediatley in the path of the cableway dragline excavator and reclaim the crushed material at will. This affords a very convenient underwater storage of this crushed material adjacent to the plant, so that when we are short on coarse material, all that is necessary is to drop the bucket down close into the bank and pick up a full load of the crushed material and convey it to the screening hopper. This method would not be practical without the use of the dragline excavator.

At our plants, we are using two 1-yd. cableways and one 1½-yd. With the latter, we excavate and convey to the washing and screening plant about 500 yd. of pit run material per 10-hr. day. All three of these cableways have a working radius of approximately 500 ft. Our 1½-yd. cableway excavates material to a depth of 70 to 80 ft. below the water line and conveys it to a hopper 65 ft. above the ground. The mast holding this cableway rests on the hopper.

Right here, I want to say that we have been operating this plant for four years, and the mast on top of the hopper has proved very satisfactory for our conditions.

The plant is located in the middle of a 10-acre tract and we are operating in a radius which will eventually cover the entire area. I know of no other method that would meet the conditions of excavating and conveying at our plant as well as the cableway dragline excavator, due to the great depth of our deposit. For, as previously stated, the material is excavated from a depth of from 70 to 80 ft. below the water line.

The conveying or operating limit of the cableway depends entirely upon the height of the mast. The average working span is about 500 ft., but I have known of successful operation of these cableways with a span of 800 to 1200 ft. An inclination of about 15 ft. per 100 is required to return the bucket to the loading point.

A two-drum hoist is required to operate the cableway. The rear drum operates the tension line which, by means of a set of block and falls attached to the top of the mast, operates the track cable which is slackened and tightened to permit the bucket to run out to the loading point and to haul

Plant of the Indiana Gravel Co. at Indianapolis

it in again from this point to the dumping point.

The front drum is used to operate the load or dragline which runs direct from the drum through a single load-line block at the top of the mast direct to the chains attached to the bucket and carrier. One cintinuous forward pull on the load-line, loads the bucket, hauls it out and dumps it. A special two-speed hoist has been designed for the operation of these cableways. This hoist has a low speed for filling the bucket and a high speed for conveying the material up the cableway from the loading point to the dumping point.

As a means of conveying from pit to hopper or from the pit direct to cars, this method is not seriously affected by weather conditions. It will operate as well in rainy weather as in fair weather. It will also operate successfully in cold weather. Only recently, I saw one of our operators lower the bucket into the pit when the pit was covered over with 4 or 5 in. of ice. By means of the weight of the bucket, the operator was able to break the ice and then he proceeded to dig the same as in warm weather. Coming from a great depth, the material is naturally warm and it is easily washed and screened in cold weather.

Barges for Sand and Gravel Transportation

By Alex W. Dann

Keystone Sand and Supply Co., Pittsburgh, Pa.

SAND and gravel barges are of three different types, first, the hopper barge in which the load is carried on the floor supported by the bottom timbers with the load below the water line. Second, the half-deck type in which the load is carried at some point between the bottom and the top and partially below the water line, and third, the flush-deck barge, which, as the name indicates, has the deck flush with the top of the sides. The first and last named types are those most generally used.

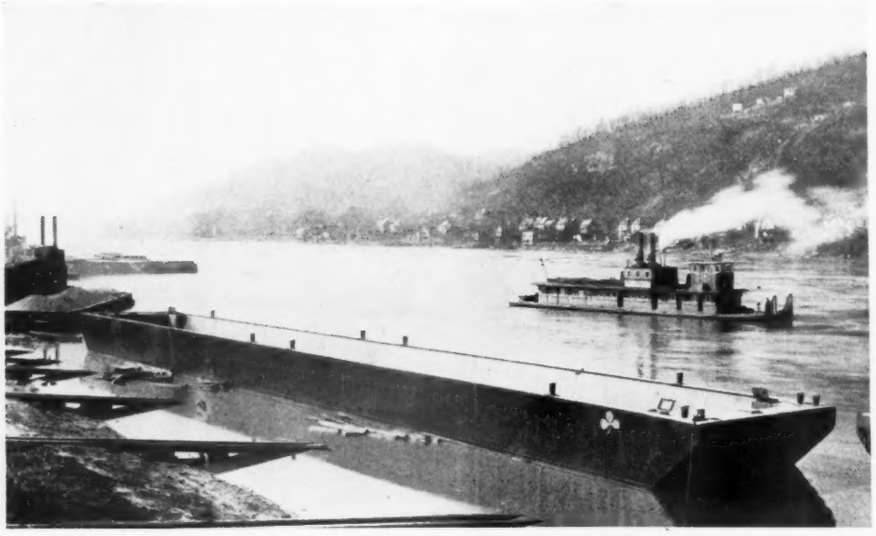
The hopper type is somewhat cheaper than the flush-deck type, but is structurally weaker and has the severe disadvantage that water used in washing reaches the barge and must be pumped out. With the flush-deck type, both wash water and rainy water run freely overboard. The load on the flush deck barge is enclosed in the cargo box built around the edges of the deck through which cargo box there are limber holes for the off flow of the water. These limber holes permit the water to drain out of the load, thereby reducing the cost of the towing and, at the same time, allowing the producer to sell drier materials, which appears as a distinct sales advantage.

Until quite recent years, the only sand and gravel barges in use were constructed of wood. Wooden barges are comparatively small, as the problem of building a permanent wooden barge of greater length than say 120 ft. is a very hard one on account of structural weakness. The lower first cost of a wooden barge often recommends it, but the cost of repairs is high at all periods of its life, and if the barge be kept in service so long as eight or ten years, it has cost much for maintenance, on account of leaks and the consequent necessary syphoning. The quality of wooden timbers available has been steadily lowered and it is harder than in times past to get good ship carpenters, hence, perhaps, we cannot build as good a wooden barge as we could ten years ago.

The design and construction of a composite barge has been carried out with frames, sides and rakes of steel and the rest of wood. The cost of such construction is somewhere between that of a wooden barge and one built of steel. It is stronger than the wooden barge but still structurally weak at the points of articulation between the two kinds of material. It is easier and cheaper to repair than a wooden barge and has a longer life.

With the increase in the size of loads and a search for a barge which would stand rough handling and require a minimum of repairs and pumping along with less power for towing, the steel barge has been developed. In this development, it has been found, of course, that the barge must be designed for the particular use to which it is to be put. For long distance towing with plenty of water and infrequent points of discharge, the large barge up to 2000 to 2500 tons burden is better because its first

Steel barge with concrete deck and oak coping around cargo box



Steel barge of newer design almost completed

cost is less per ton of capacity, and tows of large tonnage are handled easier in large units. However, a barge used in the sand and gravel business seldom has a long tow and often must be loaded and unloaded where the depth of water and maneuvering space is not sufficient to accommodate an extremely large barge. In our own service, we have different sizes with capacity varying between 375 and 750 tons. We believe that for ordinary service, these barges probably represent about the minimum and maximum sizes.

Our latest barges are built of three materials, steel, concrete and wood, but the only wood included in the design is an oak coping on top of the cargo box to act as a fender for the clam shell bucket used in unloading. We use a concrete deck 2½ in. in thickness and mixed in the proportions of 1-1½-2½, the aggregates being sand and gravel. Our more recent experience has been rather unfortunate with the concrete deck, but that is no fault of the design but rather on account of the fact that we have had difficulty in getting good concrete on these decks. The purpose of the concrete deck is, of course, to protect the barge from injury by the bucket, to make a smooth clean-up surface and a surface from which the water drains readily.

We use a concrete head log which is put into the interior of the barge after construction, the material being poured through holes burnt out in the deck at the ends. These holes are subsequently welded so as to make them water tight. The concrete is placed in forms, well reinforced, and has been found an excellent head log, preventing, under ordinary shocks, the denting of the end plate. All of the rest of the barge is built of steel, the skin plates being 5/16 in. in thickness. The frame spaces are 25 in., the cargo box is 4 ft. high.

These barges have a collision bulkhead at each end but no other water tight compartment, the strength being secured by open trusses. Access to the hull is gained at four points by the use of water tight man-holes. Each barge is equipped with six 2-in. syphons, since it is useless to assume that even a steel barge will not leak if it is bumped hard enough.

The users of the hopper type of barge express fear that the deck barge is unstable when fully loaded and is apt to upset. It can be demonstrated that the deck barge cannot be upset under any reasonable load when no water is allowed to accumulate in the hull. If a large quantity of water accumulates in the hull, the boat commences to roll and will upset. This disadvantage, however, is much more than offset by advantages possessed by this type of barge.

We believe that the matter of a suitable paint for a steel barge is still an unsolved problem. A mixture composed of eight parts coal tar pitch, one part portland cement and one part kerosene oil makes the most lasting application we have yet found, but we have also found that conditions must be just right and considerable skill used in the application to make this coat endure. We have tried many different kinds of highly praised paint and some of it very expensive, finding that it tends to vanish after the first six months. We are now using, to a considerable extent, refined tar for the painting of the outside of the boats. We have secured very satisfactory results with the use of yellow "goheen" on the interior of the barge. We have demonstrated conclusively that the interior of a barge must be painted and this by the simple method of leaving one of them unpainted upon construction to see what would happen.

Pumps and Pipe Lines as Conveyors

By HUGH HADDOW
Monantico Sand Co., Millville, N. J.

THE choice of the method of excavating and conveying material from deposit to the screens depends on several factors. The reasons for using pumps and pipe lines at our plant are briefly as follows:

The deposit which we are working is not of glacial formation but is a shallow deposit of gravel in the midst of a large sand area that comprises most of the southern half of the state. The gravel deposit is not large nor is the gravel itself large, as it consists almost wholly of stones less than 2 in. in diameter. There are very few large stones and almost no clay. The material is not cemented or bound together, so that it caves easily and the face of a cutting is never vertical.

As there is an abundant supply of water, the conditions are extremely favorable to the use of pumps and pipe lines for the handling of the material.

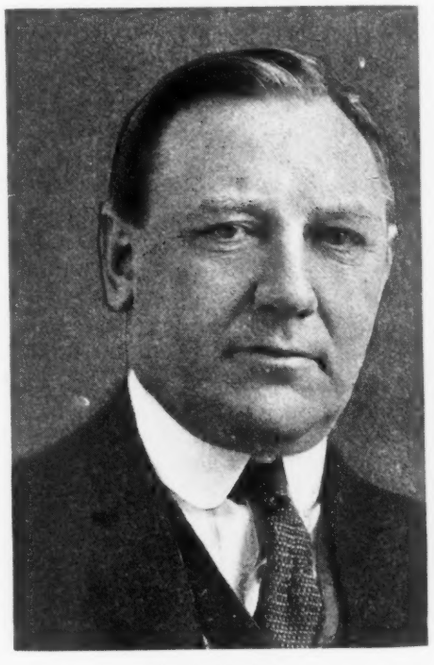
The depth of the deposit worked rarely exceeds 25 ft. below the waterline and as there is only an average of 3 ft. above water, the method of excavating has to be one that can be moved easily so as to be able to work over a large area.

The advantages of the pump and pipe line as excavator and conveyor are as follows:

First: The ease and cheapness of installation; a small barge large enough to carry the pump and driving mechanism and the hoisting engine for handling the suction line together with pontoons to carry the pipe line is all that is required.

Second: The mobility, or ease with which it may be moved from place to place.

Third: The low up-keep cost.



Hugh Haddow

Fourth: The fact that the material is handled from pit to screens in one operation.

Fifth: The washing and scrubbing that the material receives in its passage through the pump and pipe line.

Our plant at Monantico, N. J., consists of a 12-in. pump belt driven by a Corliss

engine, the steam for which is supplied by two boilers. This requires a crew of three men; a pump runner, a deck hand and a fireman. If electric power were available, the fireman could be dispensed with so that two men could excavate and deliver to the screens a total of from 1200 to 1500 tons of material per day.

The suction line consists of a cast iron suction head with openings just large enough to permit the entry of stones that will pass through the pump, a section of 12-in. steel pipe long enough to permit of dredging to the required depth and at the inner end of the pipe line a length of suction hose which gives flexibility to the line and permits the operator to swing his suction in any direction or to be raised or lowered at will. This length of suction hose we have found to be one of the parts which requires some attention as, at best, the life is short in our case, rarely over a year and a half. We have tried suction hose in 8-ft. lengths and in 15-ft. lengths, and are strongly in favor of the longer hose.

The discharge line consists of 12-in. pipe made up in lengths of about 40 ft., each length of pipe being supported on two pontoons one near each end and the sections of pipe line being joined together by rubber dredging sleeves, each 36 in. long and made to fit over the ends of the pipe and fastened by heavy clamps.

The pipe line requires no attention except when it becomes necessary to either lengthen or shorten it, and this operation is comparatively simple as it merely requires the breaking of a joint to insert an extra length of pipe or the breaking of two joints to take out a piece of pipe.

We find that the wear on the pipe line is very slight and confined mostly to wearing away at the end of the sections of pipe and we are, today, using sections of pipe that have been in use for nearly seven years.

The wear on the pumps itself is, of course, very much greater and our experience has taught us that an ordinary cast iron pump is not fitted to handle our material. We have used three types of pumps —ordinary cast iron shell and runner, manganese steel pumps and runner and manganese steel lined shells with manganese runners.

We have found that the manganese pumps made either entirely of manganese steel or manganese steel lined are the only economical pumps for our service. The life of either one of these is about one year, so that by changing our pumps during the off season in winter, we are able to run during the season of production without having to stop to change pumps.

The discharge line from the pump to the screening plant should be as straight as possible, and if a change of direction is necessary, this should be made as gradual as possible so as to reduce the resistance and wear to a minimum.

One of the disadvantages of the pipe line as a conveyor, and one that must be guarded against is overloading. If the precentage of solids handled is too high or the pressure in the discharge line is reduced too low, solids are deposited in the pipe line, and, if this is continued, the pipe line becomes plugged. This may cause a delay of several hours, but the remedy is entirely in the hands of the pump runner and there is no good reason why there should be any delays on this account.

There is probably a difference of opinion as to how far it is economical to pump material. In our practice, with the amount of power we can supply our pumps, we find it is possible to deliver material a distance of about 500 ft., at the same time elevating it about 35 ft. For a greater distance than this, it then becomes necessary to use either a booster pump or relay the material. Personally, I prefer the relay to the booster, but it is possible that I may be in the minority on this question.

Discussion

MR. SHAW: I would like to ask Mr. Haddow about what percentage of solids he pumps.

MR. HADDOW: About 10 to 15.

MR. SHAW: Is that the average all the time?

MR. HADDOW: Yes, it sometimes runs higher. We had times when it ran from 17 to 20, but that is exceptional; there are times when it will drop below 10. It depends upon the condition in the pit. If it is in ordinary pumping, we find 15% is a good average.

End of the Old West Coast Cement Trust Case

CONVICTION of R. P. Butchart, president of the Oregon-Portland Cement Co. of Portland, and Clark M. Moore, sales manager of the firm, for violating the Sherman anti-trust law was affirmed recently by the United States Circuit Court of Appeals.

The pair were indicted in 1920, together with 14 officials of certain California and Washington cement companies, for engaging in an unlawful combine to control the cement industry in California, Oregon and Washington.

Seven of the defendants pleaded guilty, seven were dismissed, and Butchart and Moore, after two mistrials, were convicted in December, 1920, and fined $5000 and $2500 respectively.

In reviewing the case, the Appellate Court ruled that there was direct evidence to show that at a conference in San Francisco in July, 1914, the cement men were agreed that the Pacific Coast territory should be divided by giving Washington to Washington companies and allowing them to fix their own prices; allowing the Washington companies to sell in Oregon as far south as Salem, but at prices fixed by California companies and giving California companies all of Oregon south of Salem and all of California.—*San Francisco Examiner.*

Rock Asphalt Company Awarded Heavy Damages

THE Uvalde Asphalt Paving Co. has just recovered a verdict of $267,929 against the city of New York for damages incurred in building the grand concourse in the Bronx. The trial consumed over three weeks, and is the second, following a reversal by the court of appeals of the previous verdict, again illustrating that the chancery courts of Dickens' time have nothing on our present system. The contract for the concourse was let in about 1901 or 1902 and completed about 1907. A final judgment, unless the city elects to pay without appeal, will take another two years, or almost two decades from the accrual of damages to recovery.—*Bulletin of Gen. Contractors' Association of N. Y.*

Iowa Road Officials' Conference at Ames, March 19, 20, 21

IOWA road officials will hold their eleventh annual conference at the office of the state highway commission at Ames, Wednesday, Thursday and Friday, March 19, 20 and 21.

Supervisors, engineers, auditors, township trustees and clerks, road superintendents, patrolmen and foremen are invited to attend this conference. The programs and discussions are confined to problems of administration, construction and maintenance, arising in road work on primary, county and township systems. There will be no display of machinery, implements or equipment of any kind. Salesmen, agents and solicitors for equipment or for publications are asked not to come to Ames during these days. The entire time of those in attendance is desired for the special business for which the conference is called.

Nova Scotia Gypsum Development

A COMPANY known as the Great Bras d'Or Gypsum Co., composed of American interests, has taken over a property at Little Narrows, N. S., formerly owned by the Eastern Gypsum Co., and is now at work developing the property with the intention of exporting gypsum. The company was formed by Freeman I. Davidson, a native of Windsor, N. S., and who is president of the concern. Mr. Davidson is also president of the Discount Co., a Massachusetts concern.

California Lime Plant Enlarging

ADDITIONS and extensions to the plant of the Mt. Diablo Lime and Marl Co.'s plant at Meinert, Calif., are under way. It is proposed to add much new machinery, including crushers and other reduction appliances, so as to greatly increase the output this year. While the company maintains its principal plant at Mainert, its office is at Walnut Creek.

Why Road Building Is a State and Federal Obligation

An Address by W. C. Markham

Secretary, American Association of State Highway Officials

I APPRECIATE very much the privilege of meeting with you, this morning, in the capacity of secretary of the Association of State Highway Officials. The relationship between your organization and our organization has been very pleasant, indeed; not only under the management of Mr. Barrows, but also under the management of Mr. Guy Sutton. We happen to be officing in the same building at Washington, and it becomes very convenient to compare notes frequently.

I wish to say that we have before us now a strenuous program before the Congress, in preparing the plan for continued federal aid, and I presume your office will keep you thoroughly informed as to the progress of this work, and what you may be able to do, personally, as the matter continues before Congress.

Railroads Not Building Highways

I cannot proceed with my subject without making a slight reference to a newspaper article which I picked up this morning, after riding in over the Missouri-Pacific, to find that, while I was lying in the berth paying $3.75 from Kansas City to St. Louis, the president of the road was "lambasting" me over the head. If he is quoted correctly he says, "the railroads are building the highways and maintaining them."

Now, what are the facts for this past year? You will find a magazine, "American Highways," out in the booth, with a chart that gives you the actual sources of revenue for the system of roads which you see in the map, and it shows that only 51% of the revenue for the highways comes from direct taxation, therefore, the railroads could not have contributed to more than 51%. The maintenance was 65% from automobile licenses, and maintenance of roads was only 15% by direct taxation. I think that is a sufficient answer to Mr. Baldwin.

Road Building a Federal and State Obligation

If I were to take a text for this discussion, I would quote from the first chapter of Coolidge and the last verse: "No expenditure of public money contributes so much to the national wealth as for building good roads."

Someone has said that, every year, 5,000,000 people join the ranks of those who must assume the business responsibilities of our national life. I am taking it for granted that this organization is forward looking enough to having some of this younger generation in its midst and, therefore, I shall feel free to make comment upon this very engrossing subject in a manner that may include some deductions already apparent to many here present.

Some Fundamentals

In the early days of our colonial history, a man (we forbear to mention his name in order that we may not embarass his descendants) proceeded by easy stages to a spot about 12 miles west of Boston. Here

W. C. Markham

he drove a stake and, while going through this ceremony, exclaimed: "This far will civilization probably go, and no farther." Having our hindsight and not being burdened with his foresight, we smile at his narrow vision of the future development of this country, and yet there are those here today who a few years ago did not dream of the tremendous revolution which has taken place in our transportation system.

The motor age, like the stone age, the iron age and the steam age, is having its inning. And it came without warning. Our people have $11,000,000,000—do you comprehend the figure?—$11,000,000,000 tied up in highway rolling stock, and this includes only motor driven equipment. Do you wonder that we have been making frantic efforts to prepare and conserve the highways over which this immense quantity of rolling stock travels? Is it not plain business sense to protect these values and render service which will lower the traffic costs? I believe I am safe in agreeing to offer a chromo to any city dweller in this country who will name one single article of clothing or food which he uses that has not, at sometime in its preparation for his use, been transported over a highway. And we are too prone to forget that this has been one of the elements in the cost of production.

Natural fertility of the soil is not the gage of land values. Transportation, centralization and accessibility have made the cities. Likewise, the farmer who lives where his products can be transported at all seasons of the year, and with the least loss in time, reaps a similar reward. Agriculture is the greatest and most necessary industry in the world, and yet we have allowed its products to shift for themselves so far as their speedy and prompt deliveries were concerned. If it will pay the farmer to use the binder instead of the cradle, it will also pay him to be able to haul to market twice as much and twice as often as he has been able to in the past. If he would control the market on his products, he must also control the condition of the roads on his way to the market.

Life Not Measured in Acres

A man's life is not measured by the number of acres he owns. The Indian who roamed this country for generations gone by, lived and died, with a fair measure of satisfaction of his animal wants. The black chief in the jungles of Africa has a world all to himself, but it is a world of nothingness, as we consider life. In their native conditions, without the possibility of any civilizing surroundings, you would not give either of them 10 cents an acre for their land. Even a white man may eke out an existence by trapping wild animals and sleeping in the caves of the mountains; he may have a hut on a by-road and raise a little corn and a few pigs; but the harder it is to reach the centers of mercantile life, the less valuable is the home of the occupant. The more perfect the transportation facilities which run by a man's farm to reach the market centers and thence to the large arteries of trade and social life, the more valuable his holdings, and the greater opportunities his family has to obtain the things worth while.

Isolation a Great Drawback

Isolation is the greatest drawback in the development of our intellectual and social life. The hermit may live in a hut far back from the road and think he is keeping himself unspotted from the world, but the chances are that in his seclusion he will be overtaken by a greater evil and becomes

covered with vermin. Nothing this world possesses is too good for humanity. It isn't so much where you live but how you live where you live. A hog loves a mud wallow but flowers won't grow on its banks. Recently, a farmer whose wife had been committed to an asylum, in talking over her condition with a physician, said, "I don't know what made her go insane. She has nothing to bother her. We live on a quiet road. In fact, she has hardly been out of the kitchen for 18 years."

The gold in the mine hasn't as much economic value as the soil on the top of the ground, so long as it remains undiscovered. The wealth of the sea can only be known by the market found for the fish in its bosom. The most bountiful crop of grain in the world has no value unless it is where it can be transported to those who would buy. A human soul never knows its power if it cannot impress its life on others.

State and National Road Building

Time was when a day's journey over a highway was eight or ten miles. Taverns and inns were erected at these distances in order that the proprietors might care for the needs of the weary traveler, and most of them doubtless were weary. When this nation began operations, it held the elections in November, and, while there were at that time no states west of the Alleghany mountains, the inauguration was held in the following March, in order that those interested might have plenty of time to get there.

That highway transportation should be more than a local problem refused to fix itself fully in the public mind, although various attempts to make a man look beyond his own rail fence were made when the Boston Post Road from New York to Boston was projected and the federal government put some money into the Old Cumberland Pike through Maryland. Gradually, work was done beyond the county lines, until in 1891, New Jersey created a state highway department with power to aid the counties. That was 33 years ago, and it took 25 years for Uncle Sam to realize that highway development was a national respsonsibility.

First Federal Road Act, 1916

In 1916, a Federal Aid Road act was passed and the government found that 31 states had assumed more or less general supervision of the construction of a limited system of roads. This act brought the remaining states into line, but there was no system or program. States found local jealousies as barriers in laying out a plan of inter-county roads and many a man has grown gray in the diplomatic service of attempting to connect up market centers and, at the same time, pass by every man's farm.

Then came the act of 1921, with requirements that the states lay out a system of roads properly connected on the state lines. Here again the problem met opposition through various state ambitions and selfish ideas of special road promotors. This experience has carried us back to an editorial which appeared years ago in the well known and seemingly broad minded *Philadelphia North American*. It was in the days of the narrow gage and broad gage railroad tracks. A forward -looking citizen had suggested that a standard gage be adopted so that people might travel from Philadelphia to New York without changing cars. The *North American*, wishing to protect its own brood of chickens, protested against this move, declaring that if such a scheme were put in force, the people of the Quaker City would call on Father Knickerbocker and spend all their money with his merchants.

Three months ago, the federal aid highway system of the United States received the final approval by both federal and state authorities. It is limited to 7% of the total road mileage of each state, until such mileage has been completed. To this system all the federal contributions are limited.

THE people have ELEVEN BILLION DOLLARS tied up in rolling stock—cars, trucks, cycles, and wagons.

Everything we eat, wear, or use in any other way comes over a highway at some time in its journey from the producer to the consumer.

These facts justify us in spending all that we are spending—and even more—in the construction of better highways. Bad roads cut down the life of the rolling stock and raise the cost of the goods we consume.

We have a right to protect our investment and reduce the cost of necessities. The only way we can do this without wasting money is by building state and federal aid highways.

The total road mileage of the United States is approximately 2,886,000 miles, of which 7% is, also approximately, 202,000 miles. This mileage may seem to many people to be a very limited system, but it connects every market center of 5000 people or more, joining up many towns of smaller size and over 90% of the entire population of the country will live within ten miles of this system. When completed, it will not only enable you to start at Boston, pass through Buffalo, Cleveland, Chicago, Denver and Salt Lake City to San Francisco, but what is of far greater importance, you can start at any county seat in any county in any state in the Union and go to any other county seat in any other county in any other state in the Union and keep on an improved road.

50,000 Miles of Surfaced Road

Of the federal aid system of roads, almost 50,000 miles have received some kind of surfacing. During the past year, about 11,000 miles were improved. At this rate of construction, it will take ten years to complete the job. Up to date, the federal government has contributed $452,000,000. It is obligated to give $75,000,000 more for the coming year. Since it is necessary that all concerned should be able to plan in advance for this work, this present Congress will be asked to approve another three-year program in which the federal participation will be $100,000,000 a year.

Dividing the Automobile Tax

This may seem like a large appropriation and it is a substantial help. However, it represents only two cents of each dollar that Uncle Sam paid out this last year to run the affairs of the general government. A high governmental official in a public address recently bemoaned the fact that the contemplated appropriation for the army and navy for the coming year is only $625,000,000 while we are going to put out $92,000,000 for roads. Why is it that his mental operations cannot make him understand that all federal money spent on roads is a basic element in our national defense? Federal taxes on automobiles and accessories the past year amounted to $146,000,000 while out of his other pocket, Uncle Sam paid $72,000,000 for roads. We presume that the remaining $74,000,000 went to the army and navy. Surely further comment on this division of the federal budget is unnecessary.

The economic value of an improved highway should need no exhaustive argument; however, allow me to give two concrete illustrations in passing.

In North Carolina, very accurate figures show that gasoline consumption in 1921 was about 510 gallons per motor vehicle. In 1922, it had been reduced to 450 gallons. This saving of 60 gallons per car for each of the 225,000 motor vehicles at current prices amounted to $3,300,000 per year. The past year, North Carolina built over 1000 miles of improved highways and expects to show a greater decrease in gasoline consumption.

Cost in Money of One Bad Road

A milk truck to the Baltimore market is compelled to operate for five miles over an unimproved road before reaching the paved highway. To all farmers on the paved road, the price for delivery of their milk is three cents per gallon. But for those living on this five-mile stretch, an additional charge of one-half cent per gallon from October to April is made, to cover additional cost of gasoline and upkeep of the truck. These farmers are paying $900 annually as an extra mud tax or $180 per mile, or interest at 5% on $3600 per mile.

During the past year, it is estimated that the American people spent $1,000,000,000 on their highways of all kinds. Of this

enormous amount, 60% was expended by the counties and townships. Of course, some of it went to fill ruts only to be washed out by the next rain, for the general public is too impatient to wait for real road construction. There are hundreds of motor bus and truck lines established throughout the country, attempting to give orderly service over earth roads that do not even have a patrol system of maintenance but depend upon the farmer living along the road to ply a road drag when he can't work in the fields.

This is not only the motor age but it is also the budget era. The time is not far distant when every state and so on down to the smallest governmental unit must operate under a budget and that means that the states' share for roads will be considered alongside of the amounts demanded by the counties and townships. The time is already here when people want to know their possible maximum tax levy for any purpose before it is made. This will bring about more conservative methods of expenditure as well as stop the frittering away of funds each year for temporary road relief, which must be done all over again when spring opens.

Federal Highways Decrease Maintenance Cost

It is an established fact that in those states where the construction of the federal aid highway system has been expedited, the cost of developing and maintaining the feeder roads has been reduced in a substantial proportion. The more perfect and dependable the highway, the greater is the traffic over it and hence maintenance of other roads is simplified because of reduced traffic over them. The poorer your roads, the more they cost you.

Various methods are used today to finance this very important work. (1) Bond issues to be retired by a tax on all property, (2) bond issues to be retired by the automobile license, (3) "pay as you go" from funds derived from a tax on all property (4) "pay as you go" from automobile license fees and gasoline tax. During the past year, the states raised $152,000,000 by automobile license, the fees running from $5.69 per car in one state to $25.73 per car in another state. The average fee for the United States was $13.24 per car. The expenditure of this money was made according to the ideas of the various legislatures; 38% went for road construction by the state, 35% for road maintenance by the state, and 27% to the counties to be used for either construction or maintenance. Thirty-six states now also have a gasoline tax ranging from one to four cents per gallon. In the main, the gasoline tax is used for maintenance.

Where Highway Money Comes From

During the past year, the states received their funds for the construction and maintenance of the federal aid highway system as follows: In the matter of construction, 10 states received no funds from a direct tax levy on property; 12 states received all the funds by this method; all the funds in six states came from the automobile license; 21 states received a portion from gasoline tax while five had special sources. Averaging the whole 48 states, it shows that 51.8% of the construction funds came from a tax levy or bond issue to be retired by the automobile license fees, 9.5% came from a gasoline tax and 2.9% came from special sources.

As to maintenance, two states secure all the funds for maintenance by a direct tax levy; 16 other states use a direct tax levy for a portion of the funds and the remaining 30 states do not use a direct levy. The main source of revenue for maintenance is the automobile licenses. Seventeen states secure all of their maintenance fees from auto licenses. There are but four states which do not secure at least a portion of their funds from the auto license. Twenty-five states received funds for maintenance from the gasoline tax, one receiving as much as 90%. There are three states which have special sources for funds for this purpose.

A summarization of sources for maintenance funds for all of the states shows that 15.0% are from a direct tax levy, 65.7% from auto license fees, 16.4% from gasoline tax and 2% from special sources.

How the Money Should Be Expended

These statements clearly show that there is a great variety of ideas on highway finance. Rapid strides, however, have been made in the past few years along the line of a sane and forward looking policy. The following general principles are acceptable to most people who have given the matter any serious thought.

1. The total cash expenditures in each state for highway purposes shall be considered as the annual highway budget.

2. The annual highway budget should be adjusted to the relative needs for other public purposes.

3. All revenues secured from motor vehicles or road users shall be set aside for highway purposes.

4. The highways within each state should be classified into four systems, interstate, state, county and local roads.

5. For the purpose of securing efficiency, all expenditures of these systems should be correlated under engineering and economic supervision.

6. The order, character and extent of highway improvement should depend upon the relative future traffic requirements.

7. A much larger mileage of highways than at present should be immediately placed under patrol maintenance, and as far as possible made available for traffic the year around.

8. The large sums involved in highway expenditures and the broad training and experience required in handling them demand that political considerations be eliminated in all highway administration.

9. The cost of building and maintaining an adequate system of highways should be distributed in an equitable relations to the benefits derived. These may be summarized as follows:

a. General benefits to society, such as influence, education, recreation, health, the national defense, the postal service, living and distribution costs.

b. Special benefits, such as those to agriculture, manufacturers, labor, railroads, mining, forestry and waterways.

c. Benefits to property served.

d. Benefits to the road user.

10. The wide variance in the present status of highway development in the several states prevents the adoption of uniform policies for securing the funds necessary to the annual budget. Generally speaking, however, those principles may be set forth:

a. States in the initial stage of highway development should issue bonds to defer that portion of the annual charge for construction which would overburden either property or the road user.

b. States where original construction program are well under way can, in the main, finance normal new construction from current funds, utilizing bond issue funds to defer the cost of special projects.

c. States where original construction is largely completed are concerned chiefly with maintenance and reconstruction, and should depend on current funds save in cases of emergency.

d. The maintenance of interstate and state highways should be a charge against the road user.

e. Roads serving a purely local purpose will generally require only light upkeep and should properly be a charge against the adjacent property, which in these cases is the first and often the only beneficiary.

11. State highway bond issues should be serial in form and should mature over a period not exceeding 40 years.

12. Highway bonds issued by political subdivisions of a state should be serial in form and should mature over a period not exceeding 25 years.

13. Serial maturities should be arranged so that the annual requirements of principal and interest will be as nearly uniform as practical.

40 to 60% Is Permanent Investment

14. Broad surveys made by the United States Bureau of Public Roads have demonstrated conclusively from 40 to 60% of the average costs of highway construction is expended in permanent improvements such as grading drainage, gradients, engineering and rights of way. Of the remaining cost, all but a small percentage of the surface can be salvaged in reconstruction. From these studies, it thus appears that long term highway bond issues are justified where the expenditure does not unduly absorb the taxable capacity of the community and where

adequate engineering and economic control is assured.

The Menace of Local Jealousies

The big task before the American people today, in this matter of perfecting their highway transportation system, is the rapid completion of the federal aid highway system. The greatest menace in this work is the local drives to secure a division of the automobile and gasoline funds. By so doing, the value of concentration is lost and the efforts dissipated. The vast majority of the traffic is over these lines and a division of the funds not only does not provide for the needs of the larger number, but it also keeps up the additional transportation costs.

Taxes Are No Crime

Some people would like to run the government—national, state and local—by popular subscription. They would then get off much easier than by the tax route. The man who is always howling about his taxes is never a man who gives either time or money for the public good, unless by so doing he may make big returns on his investment by a public demonstration of his gifts. Taxes are a levy on the property holder to pay the expenses incurred in carrying on organized society. The farther you are from the centers of civilization, the less tax you have to pay. If you don't want to pay taxes, go where there are no schools, no fire and police protection, no improved streets and highways, no hospitals, no art galleries, no operas, no electric lights and no libraries. There you can get food with a stuffed club and will not need a hunter's license; you will not need to pay a tariff on the thousand and one things that now add to your daily comfort.

Taxes Your Best Investment

Study your family budget for the past year, and you will find that you have received more direct benefit from what you paid in taxes than in any other outlay.

If all wealth would pay its share of the necessary public expense, even the large expenditures which now obtain in this country would not be a hardship to anyone. We are reliably informed that the wealth of this country is somewhere near $400,000,000,000, and yet the total amount of property turned in for taxation last year was just a little over $129,000,000,000. It is true that we have much wealth which is tax-exempt, churches, schools and colleges as well as state and municipal property, valued at probably about $30,000,000,000. There is also the much talked of "tax-exempt security," estimated as being close to $12,000,000,000, and yet the people who hold these securities are not tax dodgers; but they rather are lending you money at a less rate of interest to carry forward some public improvement. Put all these items on one side of the scale with the $129,000,000,000 turned in for taxation, and you will have less than one-half of our wealth, which is paying any tax whatsoever.

Government Less Extravagant Than the People

Government may be extravagant but it is no more extravagant than are the people themselves. A statement from the treasury department in my hands shows that in 1921, the American people spent (exclusive of automobiles) $11,254,000,000 in luxuries. These included tobacco, cosmetics, non-alcoholic beverages, candy, jewelry, chewing gum, pleasure yachts, races, pleasure resorts, etc. Statistics now being completed for 1923 will show this amount to be away over $13,000,000,000. In two years, this amount would pay off the entire national debt.

Immigrant remittances abroad plus funds spent by American tourists in Europe the past year almost equal the entire amount of money spent on all classes of roads and bridges in this country during the same period.

The tax bill for highways is not over 10% of the total tax bill of the country, and yet Secretary of Labor Davis tells us that almost 8% of our total tax bill goes to maintain institutions to care for the socially inadequate of foreign stock.

In the face of this $13,000,000,000 outlay for luxuries, the cry made some years ago that a then "billion-dollar Congress" was forcing us into utter financial destruction, makes us smile at the fellow who thought he was a John the Baptist, crying in the wilderness of political extravagance.

The Federal Reserve Board, in its Annual Report just out, says that in 1923, the American people made more, spent more and saved more money than in any other year of the nation's history.

Our National Wealth

For fear I may have taken you so far away from my text that you have forgotten it, allow me to repeat: "No expenditure of public money contributes so much to the national wealth as for building good roads."

I am quite sure that our President, when he wrote these words, was not only thinking of national wealth in terms of gold bullion, but even more so, of those things which make for the betterment of human existence that cannot be reckoned in a bank book.

The open road not only greatly enlarges a market for the farmer and reduces his transportation costs, but it puts his child in a community school where facilities for mental development far exceed those of the cities of a quarter of a century ago.

Good Highways Would Have Prevented Civil War

The wealth gained through human understanding is well worth the entire cost of this open road. Had we improved highways and motor driven traffic in 1860, there would have been no Civil War to bring its anguish and embittered grief.

The open road enables the toiler in the factory to share in the glories of the hills and the peace of the trees. The open road brings comfort to the lowly, whose forebears thought them luxuries. Field and river, mountain and glen are yours for the seeing.

Sam Waller Foss wished to "live by the side of the road and become a friend to man," but *he* is the greatest friend to mankind who builds that road, whether through the instrumentality of time or means. Surely this is a great and urgent task, and all should rejoice in the privilege it affords.

New Specifications for Whiting from Bureau of Standards

IN Circular 152 of the Bureau of Standards are given new recommended specifications for whiting, as follows:

Packing—Whiting is packed and shipped in barrels holding not more than 325 lb. or bags holding not more than 125 lb. The package should be labeled, stating whether the contents is a natural rock whiting or a chemically precipitated whiting.

Quality—Whiting shall be uniform in quality (from shipment to shipment), both as to fineness of grain and composition. The calcium, magnesium or total carbonates shall not vary more than 1% and the silica not more than one-half of 1% from a figure set by contract within the limits of the composition shown in class 1 or class 2. It should be manufactured from the purest rock available and should be practically free from particles of pyrites, iron-bearing silicates, metallic iron and gypsum.

Composition—Whitings shall be divided into two classes, No. 1 being practically a pure calcium carbonate and No. 2 containing calcium carbonate, with a considerable percentage of magnesium carbonate within the limits of the composition given. This does not indicate that one class is inferior in quality to the other, but indicates that numerous users prefer the magnesium whiting to the pure calcium whiting.

TABLE I—COMPOSITION

Constituents	Class 1—Maximum Per Cent	Class 1—Minimum Per Cent	Class 2—Maximum Per Cent	Class 2—Minimum Per Cent
Total carbonates	....	97	....	97
$CaCO_3$	....	96	....	89
$MgCO_3$	2	..	8	..
FeO_3	0.25	..	0.25	..
SiO_2	2	..	2	..
Total S computed to SO_3	0.1	..	0.1	..

Fineness—Screening samples by washing for 10 min. with stream of water practically without pressure shall not leave a residue of more than 1% on a No. 140 screen (or more than 2% on a No. 200 screen), and at least 98% of the material shall pass a No. 200 screen. It shall also be so fine that a separation made by a Pearson air separator will show at least 85% of the material finer than 0.02 mm. and at least 48% finer than 0.01 mm.

The Effect Upon the Aggregate Producer of Scientific Concrete

By Col. R. C. Boyden
Of the Portland Cement Association

BEFORE coming here I asked Nate Rockwood what subject I should talk on. He suggested "The Effect Upon the Aggregate Producer of Scientific Concrete." In thinking over that subject, I have been rather puzzled to know just how I would attack it, and it has seemed to me that the best way was to outline to you what we mean by scientific concrete; outline to you some of the benefits that may be attained by the use of scientific concrete; show you some of the places and the extent to which scientific concrete is being used today, and then leave it to you to judge for yourselves how you can assist us in putting this great work over.

12,000,000 Yards of Aggregate

As you all know, the Portland Cement association is composed of the cement manufacturers on the North American continent; 95% of all the cement manufactured on the continent is produced by members of this association. We have nothing to sell. We are interested, we will admit, in increasing the use of concrete, but we are far more interested in obtaining good concrete; in improving the quality of concrete.

Now, the producing of sand and gravel or "pebbles," as we call it—we do not like that word "gravel"—for concrete is only one of your activities, nevertheless, it is an important one. Last year, the cement industry produced and sold over 135,000,000 bbl. of portland cement. Now, of course, that was all made into concrete; not all of the concrete was made of sand and pebbles, much of it was made of sand and broken stone, but a very considerable percentage of that concrete was made of sand and pebbles.

One hundred thirty-five million barrels of cement is 20,000,000 cu. yd. Now, if we would consider that this concrete was made of the 1-2-4 common mixture, we would require for that amount 40,000,000 yd. of sand and 80,000,000 yd. of stone (whether it be pebbles or broken stone) or, in other words, 120,000,000 yd. of aggregate must be produced by somebody to go into the concrete that is being made each year, and that is going to be an increasing quantity every year, because the cement industry has just begun.

Let me translate that into one or two other forms, just roughly, to convey to you an idea as to the amount of concrete that is being made each year. That amount of concrete would build 11 6/10 Lincoln Highways, from the Atlantic to the Pacific, 18 ft. wide and 8 in. thick. It would build 1,350,000 6-room houses, concrete from the cellar to the roof. It would reproduce the largest single structure that was ever created by the hands of man, so far as we know, the great pyramid of Egypt, 29.6 times.

Let me give you one more idea: Last year, as near as we can figure out, the people of this country paid out, in cash, very close to $1,350,000,000 for concrete in its various forms. That concrete was not all good concrete. I do not mean that it was all bad, because most of it is good concrete; but it could have been improved; it could have been improved one-third and in many cases one-half.

Col. R. C. Boyden

An Undeveloped Asset

What does that mean in dollars and cents? That means that there is an undeveloped potential asset each year of from $450,000,000 to $675,000,000. How can that be realized? That can only be realized by making concrete scientifically. In other words, when we design a building we design it to carry a certain load; we figure our columns, our floors, our beams, our girders, our foundations to carry a certain load. Then we, today, in most places, simply say to our contractor, "Take some cement and sand and stone or gravel or pebbles and mix them up in some empirical proportion, 1:2:4, 1:3:6, or any other nice sounding proportion, and then we will take the responsibility for the result." You do not know, your architect or engineer does not know, what he is going to get into that building, because every choice of materials that the contractor makes is going to give a different result in the concrete.

Work of Professor Abrams

Now, our idea is that we shall design our mixture from the materials which are available for that particular job, to give us a concrete of the strength that is desired in each particular part of the structure. It can be done by the methods that have been developed by the Structural Materials Research Laboratory in Chicago, a laboratory which has been in operation since 1914, and which has cost the Portland Cement Association nearly $500,000 to maintain. One hundred thousand dollars was spent there last year. A laboratory that is not run for profit (there are no charges for its services or its investigation) but one that is run entirely for the betterment of concrete.

Professor Abrams has brought out two things of great outstanding importance, he has brought out many other things, but the most important is this, that the strength of concrete is dependent more than any other one thing upon the water-cement ratio, that is the ratio between the volume of the cement and the volume of the mixing water. The less water that is used for a given volume of cement, so long as the mixture remains plastic, the stronger is going to be the concrete; the more water used for that same amount of cement, the weaker is going to be the concrete. Every pint of water used per sack of cement, more than the proper amount, does the same harm as would throwing away a quart of cement out of each sack.

Another thing brought out is called the fineness modulus of the aggregate. Perhaps some of you have heard of that, and you have said you do not believe in it, or you do not understand it, or you do not want to use it. But the fineness modulus is a very simple factor.

You take a certain set of sieves, start with a 100-mesh sieve and double the width of the opening each time; therefore, use 100, 50, 30, 16, 8, 4, ⅜, ¾, 1½-in. and 3-in. sieves. Take a sample of sand, gravel or broken stone, separate it with that set of sieves and add together the percentages of the total sample that are coarser than each sieve. Naturally, you can see that anything that goes through the 3-in. sieve will not go through the 1½-in., so each one of these is

an accumulative percentage. Add all those percentages together and get a figure. Divide that figure by 100, and the result is called the fineness modulus of the aggregate.

What does the fineness modulus mean? It means this: that the higher the fineness modulus is—up to a certain point; there is a limit—the less water will be required with a given amount of cement to produce a given plasticity. What does that mean? That means that if we are going to put in a column in a structure, we require a certain amount of plasticity to get the concrete in around the reinforcement. With a choice of two materials to make our concrete with, that material which has the highest fineness modulus will require the least water to give us the necessary plasticity. That means that we are going to get our work done with a lower water-cement ratio and we are going to have a stronger concrete.

With the use of this factor, we are able to design our mixture, so that we can be sure that the concrete in each part of our structure shall have the proper strength.

A Benefit to the Producer

This does not mean a hardship on the aggregate producer, just the contrary, it means a great benefit to him. Why? I think if many of you will look back, many of you will remember that rules laid down in the past, and which are in effect today in many places, prohibit the use of certain materials in your own locality, perhaps in your own plant or your own pit.

Now, by the proper use of the water-cement ratio theory and the fineness modulus, we are able to use practically any material, provided it is clean and properly graded, that is, uniformly graded. We can make concrete of any desired strength from practically any physically suitable material. There are many places where we have been able by these methods to make concrete where they never were able to do it before.

Now, as I told you, the great interest of this association is to get better concrete, to get scientific concrete, but we can only do it through the co-operation of the aggregate producers. Of course, we can keep hammering at it and hammering at it, as we are today, and will continue to do from this time on, but if the aggregate producers will not give us uniform aggregate, we are not going to get uniform results. I think you can all realize that one necessity for scientific concrete is uniform aggregate, aggregate that will have the *same fineness modulus* for consecutive batches and for each and every batch during the work. Of course, the design can be changed at frequent intervals, but that is not economical; it causes confusion and casts discredit on the idea, so that your co-operation is asked for in this great work.

I want to show you the possibilities that may be had by using scientific concrete. In my talk, you will hear me refer very frequently to slump, the slump of concrete. Now the slump test is the method which has been devised for controlling the consistency and, through the consistency, the water-cement ratio. The slump test is made with a sheet metal frustum of a cone, 4 in. at the top, 8 in. at the bottom and 12 in. high, with handles on each side. The cone has neither top nor bottom. It is set on a smooth surface and filled one-third full with the concrete as it comes out of the mixer. That concrete is rodded just 30 times, not 29 or 31 but 30, with a pointed, ⅝-in. steel rod. The next third is put in and that is rodded. The last third is put in and that is rodded.

UNIFORMITY, good grading and cleanliness are the important characteristics of a good concrete aggregate. Uniformity is most important.

The concrete of the future will be designed to bear a certain definite weight. This is Scientific Concrete.

The design will be worthless if the aggregate is not uniform. The concrete will vary as the grading of the aggregate varies.

Scientific Concrete will demand more separations than two (gravel and sand) so that the aggregates may be compounded to produce a required modulus of fineness.

Where aggregate of more than one size is handled the utmost care should be used to prevent the fine and coarse from seggregating.

In the near future all aggregates will be weighed or some such method as the Inundation Method described in this paper will be used in concrete mixing.

Then the cone is lifted off. Depending upon the water, the concrete is going to settle down. The distance that it settles from the original 12-in. height is called the slump. You can see that a concrete which would only settle 1 in. is a very stiff concrete; and a concrete which settles 10 in. is a very plastic concrete.

Curious Ideas of Concrete

Some have a very erroneous idea regarding scientific concrete and regarding the slump. They think that when we speak of a scientific concrete, with a low water-cement ratio, we mean a stiff concrete. We do not. You can get any plasticity that you want, between a 1-in. and a 10-in. slump (which are the limits between which you should work) and still get the same strength. Always remember this; when you get increased plasticity or high slump, you have to use more water, and, in order to maintain the same strength, you have to use more cement to keep the same water-cement ratio. Remember that high strength concrete, with a low water-cement ratio, does not necessarily mean a stiff concrete; it may be very plastic.

To give you a little idea of the slump again, the plasticity which is necessary for road work, where you are going to use a mechanical tamping machine, is ½-in. to 1-in. slump concrete. If you are going to build that road with hand strike boards and no mechanical tamping machine, you will have to use from 1½-in. to 2½-in. slump concrete. If you are building a bridge or a building of reinforced work, you will have to use, for the great bulk of your work, 3-in. to 4-in. slump concrete.

7-in. Slump Is Enough

I want to go right on record here and tell you that there is no concrete that ever needs a slump of more than 7 in., I do not care where it is, and what is more than that, for 99% of the work a 3- to 4-in. slump is ample.

Let me show you the possibility of the saving, and when I speak of saving, I mean saving cement. Everything that I am telling you today means the use of less of our product. Can you ask any better evidence, gentlemen, of the sincerity of the cement industry when we will consistently preach the use of less of our product? Good business, you will say. We believe it is good business. It means the use of more cement eventually, but you and your clients are the ones who are going to get the benefit of it in every yard of concrete that you put in.

A Concrete Case

Let us take an all concrete building and assume that it will contain 10,000 cu. yd. of concrete. We will take a sand graded from 0 up to ¼-in., and a stone graded from ¼-in. to ¾-in. We will say the cement cost is $3.10 a barrel, net. Now, we want in that building to design concrete that shall have a strength of 2000 lb. per sq. in. in 28 days. With a chuting system we will be very conservative and say that they are going to use a 6-in. or a 7-in. slump, which I think you will all agree with me is conservative with a shooting system. We would find that we would need 1.63 bbl. of cement for each yard, or a total of 16,300 bbl. of cement for the job. Now, if we used a tower and placed that concrete with buggies, using a 3-in. to 4-in. slump, which is amply plastic for our work, we would only need 1.37 bbl of cement per cubic yard, or 13,700 bbl., or a saving of 2600 bbl., or $8060 that we would save in cement on that one building.

Now if we had used an 8-in. to 10-in. slump, which again is conservative for a great many buildings that are being put up where they are using a chuting system, we would find that we could have saved $24,800, by cutting that slump down from an 8-in. to 10-in. slump to a 3-in. or 4-in. slump. In other words, by decreasing the plasticity down to a point which is amply plastic for the work, we would have affected a saving

in cement of $24,800. Yet we would have gotten exactly the same strength in our finished product. That is just one illustration of the possibility of saving in the cost.

Testing Aggregate

I want to touch on testing and controlling aggregates: The statement is sometimes made that it is impossible to obtain laboratory results in actual construction. That is undoubtedly true in some cases, due to the difference in the methods of testing and controlling the aggregates. Nevertheless there are many cases where the field results have equalled and even exceeded laboratory results, and they have also shown wonderful uniformity.

It is obvious that an improperly taken sample from an aggregate supply would not be indicative of the total supply, and if a mixture were designed from this sample, the actual contruction results would not agree with the laboratory design.

It is also obvious that if the aggregate used on the work is not uniform in its grading batch by batch, we will also find no uniform results in the concrete. These are only two of the reasons for the statement regarding the difference between laboratory and field results and an understanding of the methods to be employed in both laboratory and field will serve at least to reduce the difference.

The fundamental principle of laboratory testing is uniformity, and this can only be obtained by eliminating the personal equation and by performing each operation in exactly the same manner each time.

When a sample of aggregate is received in the laboratory for the design of a mixture, it is assumed to be representative of the entire supply and the calculations are based upon that assumption. The sample is thoroughly dried to remove all moisture, as all tests are based on absolutely dry materials.

Moisture Causes Sand to Bulk

This is a very important phase of all testing, owing to the fact that moisture contained in the sand will cause it to bulk and consequently weigh less per cubic foot than dry sand. This difference will sometimes run as high as 25%, and commonly as much as 10%, and it is due to the less number of grains of the damp sand as compared with those in an equal volume of dry sand.

Always remember that all laboratory measurements of volume and weight of aggregates are based on dry, rodded materials and must not be compared with measurements made in the field of loose damp materials. In the laboratory, all measurements are made in a receptacle whose diameter and height are equal. The dry material is placed in the receptacle in three layers, each layer being rodded (or puddled) exactly 30 times with a pointed 5/8-in. steel rod. The material is then heaped up and struck off level with the top.

The difference between the weight of an equal volume of dry sand puddled in the above manner and the same sand shoveled into the receptacle will often equal 5%, while the difference between the dry puddled sand and damp shoveled sand will sometimes run up to 25% or even 30%. This fact is often the cause of the difference between designed strengths and actual strengths on the structure and it is also the cause of variations in the yield of finished concrete.

Illustration of Bulking

Illustrating this point: It was found on one large job that it required 6512 yd. of sand and stone measured loose to make 4800 yd. of finished concrete. In this case, the volume produced was only 74% of the sum of the loose volumes of sand and stone. In another case on the same structure, it required 11,700 yd. of loose, measured, premixed aggregate to produce 10,450 yd. of finished concrete, or 86.5% of the original volume.

Experiments in the laboratory have shown that 1.00 yd. of mixed, dry, puddled aggregates when made into concrete will produce from 1.02 to 1.05 yd., which clearly shows the difference between laboratory and field methods and the effect upon the results.

Differences on Safe Side

Fortunately, these differences are on the safe side, as the cement factor in the finished concrete is greater than the estimated factor, therefore, there is no liability of failure. Nevertheless, if we are to attempt scientific design, these differences must be taken into account and proper allowances must be made.

Although it is not always possible to reach laboratory refinements in making tests of aggregates and test specimens in the field, the best results will always be obtained where the greatest care is taken and a description of the methods to be followed will serve to help avoid inaccurate results:

1. Get samples of the aggregates at source of supply. Be sure the sample is *representative* of the supply. A sample of sand should be at least 50 lb., and the gravel or stone sample should be at least 100 lb. Spread the sample on a piece of canvas or oilcloth and shake well into center, then spread out and divide into four quarters, discard two of the opposite quarters, mix remaining quarters in same manner and quarter again until sample is correct size (about 10 lb) for sieve analysis. Remember, in sampling a pile of coarse aggregate, that the larger particles have a tendency to roll to the outside, so obtain sample representing all parts of the pile.

2. Dry the sample thoroughly before separating by the sieves.

3. Separate sample into its component sizes on a set of U. S. Standard sieves, using 100, 50, 30, 16, 8, 4, 3/8-in., 3/4-in., 1½-in. and 3-in. sieves.

4. Obtain weight per cubic foot of sample (dry) by measuring in ½ cu. ft. (about) measure whose diameter equals its height. The measure to be filled in three layers, each layer to be rodded exactly 30 times with 5/8-in. pointed steel rod, the measure then heaped up and leveled off.

5. Obtain fineness modulus of sample by adding the percentages (by weight) of total sample *coarser* than each of the above sieves and dividing the total by 100.

With the above information, it will be possible to design a mixture for any desired strength at any desired plasticity or slump, with assurance that the final results will be in accordance with the design, provided that the materials used uniformly agree with the sample tested.

Control of Aggregates

This brings up the question of control of the aggregates, which is an important phase of the work. Having fixed upon a desired gradation of sizes, and having designed a mixture upon that basis, it is absolutely essential that the supply of aggregates shall be uniformly of that grading, or at least shall have the same fineness modulus.

One of the strongest arguments brought forward against the use of scientific methods of control of concrete has been the difficulty often found of obtaining aggregates of uniform grading. Unfortunately, this argument is well founded in many cases and is due to the fact that the need for uniformity in grading has not been realized and commercial methods of supply have not been built up with this idea in view.

Nature itself almost never deposits concrete materials uniformly graded, consequently it is extremely dangerous to use them directly from the pits and from beds of rivers and lakes. Where the work is of sufficient size, it is possible to separate and re-combine pebbles and sand in the proportions desired; but where commercial supplies are used, rigid specifications are necessary, and these often mean a complete revision of methods in use at the plant.

Need Revision of Handling Methods

Where there have been failures to obtain proper control of the aggregates, they can always be traced to an endeavor to obtain more modern requirements with present methods of supply, which are not the proper ones for the purpose. The best results can only be had through a complete revision of present methods of handling aggregates, and this will come as the demand for properly graded and controlled material increases.

In one section of the country, nearly all commercial plants furnish aggregates premixed, and much difficulty is found in obtaining proper control of the grading. This is due to a number of factors; first—separation of the pit run material into too few subdivisions; second — improper methods of loading for shipment; third—segrega-

tion of sizes in transit and in stock piling.

Nearly all gravel deposits contain an excess of fine sizes, although occasionally the opposite is true, and unless there is a market for this excess, there is a natural tendency to overload the desired mix with these sizes. In some localities, there is a demand for certain sizes in other lines than concrete work and the material may be robbed of these sizes to satisfy this other demand.

Why More Sizes Are Needed

The usual division of sizes is into fine and coarse only, with the No. 4 screen as the line of division. If the gradings within the two subdivisions were uniformly the same, there would be no need for further division, but unfortunately this is seldom the fact, and four subdivisions are generally necessary. Some pits require even more than four, running as high as eight in some cases.

The real trouble comes, however, in the method of loading into cars, trucks or barges for shipment. Instead of shipping the different sizes separately for mixing on the work, they are loaded in the same car or barge from the bins, generally in separate piles, the coarse material in one end and the fine in the other end.

When the car or barge reaches the job, if the material is unloaded either by hand or with a clamshell bucket, the separation into small piles of each class continues and it goes into the mixer in this unsatisfactory condition. Even where the aggregate is stored in stock piles built over a tunnel, the results are the same and non-uniform concrete will be the result.

A Large Scale Demonstration

This was very clearly demonstrated on a large bridge job in Ohio, where is was found necessary to use an 8-in. slump in order to get good face work with the pre-mixed aggregates. On changing to separated materials, mixed in correct proportions at the mixer, excellent work was obtained with a 4-in. slump.

One large material plant near New York has made a distinct step in advance by separating into seven sizes. The various sizes are delivered onto a belt which conveys the mixture to scows or cars. The proportion of each size in the mixture is controlled by gates on the bins, so that any desired mixture may be delivered. Even this method is open to criticism, due to the tendency of the material to segregate in transit and in stock piling, but it is far better than the methods more commonly used.

Remembering that uniform, accurate grading of the aggregate when it enters the mixer is necessary for uniform concrete, it can be readily understood that there must be a complete revision of the present methods employed in handling and storing the materials. Unless such methods can be devised and proved to be reliable by frequent tests of the aggregate as delivered at the mixer, it would be well to keep the sizes separated, at least until they are actually placed in batches ready for mixing.

Referring again to testing, it is always advisable to check up the fineness modulus and unit weight of the material at the mixing plant at least once each day, in order to permit changes to be made in the mixture when the grading varies from the designed proportions.

The Inundation Method

Before I close, I want to call your attention to one other thing, and that is a method of proportioning on the job, which I, personally, and many others who have studied the matter have great confidence in, and that is called the inundation method of proportioning in construction.

In previous paragraphs, attention has been called to the bulking effect that moisture has upon sand, and to the inaccuracies of measurement and proportioning that occur in construction, because of this fact. The varying moisture content of the sand will also affect the strength of the concrete in direct proportion of its effect upon the water-cement ratio.

Owing to the impossibility of determining the actual amount of water contained in the sand during construction and to the fact that a wide variation may, and often does, occur in consecutive batches, a considerable amount of study has been given to devise an automatic method that would solve the problem.

There are really two basic problems that must be solved: First, the designed water-cement ratio must be maintained as a constant for each and every batch. Second, the same number of grains of sand must be put into each batch as would be contained in the designed volume of the same sand measured dry and puddled (rodded). A little thought will convince anyone that neither of these conditions are reached on many jobs where the moisture content of the sand varies from time to time with a consequent variation in volume (and unit weight) due to bulking.

Test on the Method

This inundation method is the subject of considerable discussion and a series of tests run at the Bureau of Standards by G. A. Smith and W. A. Slater is described in Vol. XIX, 1923, Proceedings of the American Concrete Institute, pages 222-240.

In the summary of these tests, the following is quoted: "The results of the tests indicate that when sand is measured in water, the quantity of sand per unit of volume is almost constant, regardless of the original water content of the sand and that the water filling the voids in the sand is also nearly constant for any given method of placing the sand," also "The shoveling of the sand into the water gave more nearly constant quantities of sand and of water per unit of volume than any of the other methods used."

These two conclusions prove that it is possible to solve the two basic problems given above, by proper use of the inundation method. This method has been tried out in a number of places and the results have been surprisingly uniform concrete strengths.

I might say that this method is patented. I am not trying to advertise it, but I want to tell you of it, because the prophesy has been made that within five or ten years, all material going into concrete on any important work will either be proportioned by the inundation method or by weighing, and with the probability that the inundation method will be the one most in use. The device was patented by R. L. Bertin, chief engineer of the White Construction Co., New York.

The Inundation Can

He has patented and is developing a measuring device or "inundation can," which is simple and inexpensive and produces the desired results economically. It is a sheet iron can about 2 ft. in diameter and perhaps 3 ft. in height, devised so that it can be varied in depth. Beneath this can is a second can of a smaller size, which has an adjustable bottom; between the two is a trap door, which permits water but does not permit sand to go into the lower can. The reason for these two cans is this: The amount of water required for inundating sand is not sufficient of itself to give the desired plasticity nor the desired water-cement ratio, so we have to add what is known as "complement" water, and that lower part of the can is called the complement can.

Method of Using It

The method of using this is simple: The can is supported on trunnions on wheels running on a track, one end of it comes under the sand bin. The can is partly filled with water (you can fill it full if you want to), the complement can becomes immediately full, and there is some water in your top can, the sand can, then the sand is dumped in from the bin.

As the sand pours into the water, it gradually raises the water level until the water begins to flow over and when you have put in sufficient sand so it will be level with the top, then you have—no matter how much moisture you had originally in your sand—exactly the same number of grains of sand in there each time and the same number of pounds or gallons of water.

That can is then run to the mixer and turned upside down, directly into the mixer. The trap between the two doors opens, permitting the water from the complement can to flow out freely so as to avoid loss of time. No other water is put into the mixer except that which comes with the inundated sand and the complement water. The cement and stone or pebbles are put in according to their proper proportion and the mixture will always be uniform.

In closing, I just want to outline to you one or two of the large jobs in the country where scientific methods have been used and the results they have obtained there. The most important piece of work that we know of, where scientific methods have been used, is on the Queenstown-Chippewa Development of the Ontario Power Commission at Niagara Falls, Ontario. This work embraced all kinds of concrete structures, including intake works in the Niagara river, concrete lined canal several miles long and a large power house at the base of a cliff between 300 and 400 ft. in height.

Concrete of Predetermined Strength

There have been placed on this job, to date, approximately 435,000 yd. of concrete in four classes as follows:

1000 lb. strength corresponding to 1:3:6: Cement content 0.91 bbl. per yd.

1500 lb. strength corresponding to 1:2½:5. Cement content 1.12 bbl. per yd.

2000 lb. strength corresponding to 1:2:4. Cement content 1.36 bbl. per yd.

2500 lb. strength corresponding to 1:1½:3. Cement content 1.55 bbl. per yd.

The cement contents I have given you are the actual contents used on the job. A very careful control has been maintained throughout this entire job and the strengths have been uniformly higher than the designed strength. Now, by reason of this control, they have made an actual saving over the amount of cement that they would have used, of more than 145,000 bbl. Every barrel of cement on that job cost them $3.20 net, consequently, they have saved very close to $500,000 in cement alone, and the inspection necessary to get this work has not cost them one cent more than the inspection that should have gone on for any high-class concrete work.

I might say that one of our member companies, the Canada Cement Co., which furnished the cement for this job, because of scientific methods is out the $500,000 which they saved in cement, and yet the Canada Cement Co. is unreservedly back of this idea of scientific concrete.

Getting Better Concrete

The Big Four railroad, at Sidney, Ohio, put up a big bridge of about 28,000 yd. of concrete, over the Great Miami river, and their experience was exactly the opposite of the Niagara Falls work. Instead of making a saving in cement over what they had been using before, they made an apparent increase in cement of 11,625 bbl, which cost them about $35,000. You would say that this is not very good economy, yet it was economy for this reason: They used exceptionally high stresses in their design, strengths which they had never gotten with their old type of concrete, so they were getting very much better concrete than they had ever gotten on other bridges.

The work was all scientifically controlled, and their mixtures were designed with such care that final results uniformly agreed with their design, within a very reasonable range of variation, and the engineer stated to me that similar methods will be used in the placing of all future concrete on the system, and they will never go back to the old method.

The Canada Cement Co., year before last, built itself an office building in Montreal, Canada, which cost $1,400,000 and let their contract for 3000-lb. concrete, that is, concrete which should have a compressive strength of 3000 lb. per sq. in. in 28 days. After the contract was started, it developed that the contract mixture required more plasticity to be workable, which meant more cement, and, in order not to work a hardship on the contractors, they permitted them to put in 2500-lb. concrete in the floor slabs and beams, requiring the 3000-lb. concrete in the columns.

Their reason was that they discovered that the engineer who designed the structure did not have any confidence in the ability of the contractors to get the designed strength, consequently he had added about 25% to his design. When they found that out, they felt justified in cutting down to protect the contractor.

Actual Figures

Fifty-one cylinders were made of the column concrete and broken in 17 sets of three each. The average of the 17 sets was 2996 lb., the range was from 12.9%, under 3000 lb. to 17.66% over. Thirty-three cylinders made from the beams and slabs gave an average of 2622 lb., over 4.88% above required strength with a range from 8.8% under to 17.6% over.

These results are exceptionally good when it is considered that the methods were new to all and the attitude of all, except the owners, was, at first, that of passive resistance. Before the work was completed, however, all concerned were convinced that it was feasible to control the strength of concrete and, at the present time, there is being constructed a large addition to the Morgan building in Montreal by the same architect and engineer, in which the same methods are being followed.

About two years ago, the state of Nevada, in building a concrete road from Reno to Carson City, was using an empirical mixture and a specification for aggregate (Fuller's curve) that necessitated wasting a considerable portion of the material from the pit and only gave a 1400-lb. concrete. By following scientific methods, a mixture was designed that permitted the use of all the material without waste and gave a 2500-lb. to 3000-lb. concrete, thereby saving the expense of wasting aggregate and, at the same time, bettering the quality by 75 to 100%.

The City Water Commission of Montreal, Canada, are also using scientific methods in the design of concrete for reservoirs, etc., and are getting excellent results.

The Borough of Queens, New York City, is building a boulevard across Jamaica Bay, Long Island, entailing the use of over 70,000 yd. of concrete and costing over $3,500,000. The structure is a concrete roadway supported on concrete piles 24 in. square, driven to refusal in a salt water marsh and subject to the action of salt air and some wave action. For this reason, James Rice, the engineer in charge, decided to use scientific methods of design both for strength and imperviousness.

The contract provided that the concrete should have a compressive strength of 3000 lb. per sq. in. at 28 days, or should be of an equivalent density. There is no provision in the contract that permits the acceptance of any concrete falling below the contract strength and such concrete is condemned, based upon an average of three test pieces.

Laboratory in the Field

A field testing laboratory is maintained at the pile casting yard, and careful watch is kept of all phases of the concrete work. The original contractors were entirely out of sympathy with scientific methods of concrete making, and considerable trouble was had in making them live up to the contract requirements, but the present contractors, to whom the work was afterwards assigned, are having no great difficulties in obtaining the desired results.

One very gratifying phase of concrete making in actual construction is the fact that on many jobs far higher results are being gotten with the empirical mixtures than has been the result in the past. This is, of course, due to the simple method of reducing the water-cement ratio by utilizing lower slumps.

One instance occurred on a water conduit from Great Falls, Va., to Washington, D. C., built under government engineers, and requiring the use of 150,000 bbl. of cement. A 1:2:4 mixture was used at a 2 to 3-in. slump, and the average strength shown by 200 cylinders was approximately 2700 lbs. per sq. in. When it is remembered that the soupy 1:2:4 concrete used in the past rarely gave a strength exceeding 1500 lb., the advantage of cutting down the slump and the water-cement ratio is readily seen.

Saving Cement by Lessening Slump

Another example of this kind was on the Victor Talking Machine Co.'s building at Camden, N. J., which required about 12,000 yd. of concrete. The mixture was also 1:2:4 and was placed with elevators and buggies at from 7- to 8-in slumps. More than 70% of the tests on this building came within 10% of 2200 lb. per sq. in., and this figure could have been greatly increased by using a less slump, which would have been amply plastic for the work.

A study of the aggregates used showed that the 1:2:4 mix was the most economical mix, therefore, the saving and gain in strength would have to come through the

use of a lower slump and water-cement ratio.

In order that there might be no possibility of failure or deterioration on the Memorial Stadium at the University of Illinois, accurate control is being kept of the 22,000 yd. of concrete in the structure. With the proportions fixed in the contract, it was found that the plasticity required for some of the work would reduce the strength below the designed figure. Through careful study, it was found possible to readjust the mixture to give the desired strength concrete at the necessary plasticity, without increasing the cement factor or the cost to the contractor.

The above structures are only a few of the many where scientific methods have been or are being applied to a greater or lesser degree, but they indicate the wide range covered both in type of structure and in geographical and climatic location. Although the examples given are all sizeable structures, the possibilities of economy and increased strength are proportionally as great in small structures of all kinds, and the need for these desirable qualities is equally important.

The purpose of these lines is to smooth out, if possible, some of the difficulties that are being encountered in construction where scientific methods of design and control of concrete are being used, by outlining proper methods to be followed as gathered from the experience of others in the past. It is hoped that the lessons shown will be accepted in the same spirit of helpfulness and co-operation that they are given, and that the results obtained will be all that may be hoped for.

Use of Sand and Gravel in Road Construction

By James T. Voshell
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MY subject this morning is The Use of Sand and Gravel in Road Construction. In round numbers, 26,540 miles of road have been completed under the provisions of the federal aid road act up to July 1, 1923. In constructing this mileage, sand and gravel entered very largely into the construction of 15,780 miles at a cost of $333,000,000. It is estimated that 47,400,000 tons of sand and gravel were used.

From data collected by the bureau, we find that the federal government and the states and their various political subdivisions are now spending at the rate of more than $1,000,000,000 annually in constructing and maintaining roads. It seems reasonable to assume that sand and gravel enter into the construction of other than federal aid roads to as great an extent, at least, as they do into federal aid roads. If this is true, then sand and gravel are being used at the rate of approximately 142,000,000 tons annually in road work.

Where does all this sand and gravel come from—enough to load a train of 100-ton cars, 14,000 miles long—and how much is furnished by commercial plants? In 1920, we made a careful survey of all commercial sand and gravel plants, with a daily production of 300 tons or more, in 22 states located in the Northeastern and North Central part of the United States. In these 22 states, there were 567 plants in operation with a total estimated production of 45,000,000 tons for 1920, of which 14,500,000 tons were used in road work.

We believe that at least two-thirds of all of the plants in the United States are located in these 22 states, and that all the sand and gravel produced by commercial plants for road use in 1920 was not much in excess of 20,000,000 tons. In 1920, however, most sand and gravel plants were not worked to full capacity on account of a serious shortage in freight transportation. In fact, few were worked at more than half capacity. In the year just passed, practically all plants were worked at their full capacity and, making a fair allowance for new plants, it is probable that commercial production of sand and gravel for use in road work in 1923 was 50,000,000 tons.

If the above conclusions are right, we find that nearly 100,000,000 tons of sand and gravel are now being used that come from local deposits, some of which are very satisfactory for the purposes for which they are used, while some are very unsatisfactory.

It does not seem worth while to suggest how the sand and gravel producers might persuade the highway engineers to use more commercial sand and gravel than they are now using, for they are already using all they can get. They are even compelled to use some materials that are not entirely satisfactory, because a sufficient amount of satisfactory material cannot be obtained.

SOME 142,000,000 tons of sand and gravel used in road work each year, enough to load a train 14,000 miles long. In 1920 it was only 20,000,000 tons.

Poorly graded aggregate loses money to the road contractor in two ways. It wastes cement (for the same strength of concrete) and it wastes time in placing the concrete.

The sand and gravel industry is now mainly in the "saw log" stage. It should advance to the "Chippendale furniture" stage.

The most extensive use of sand and gravel in road work is in concrete for structures, road bases and surfaces and for constructing and maintaining gravel roads. For each use, the sand and gravel must meet moderately detailed requirements if the resultant work is to be of the quality and render the service expected. These requirements will be discussed briefly.

Generally speaking, sand and gravel for use in concrete must be composed of particles of sound stone, reasonably clean and fairly well graded in sizes. Following are typical requirements for grading for gravel and sand when used for coarse and fine aggregates in concrete.

COARSE AGGREGATE

Passing 2-in. screen	100%
Passing 2-in. and retained on 1-in. screen	25 to 60%
Passing ¼-in. screen not more than	10%

FINE AGGREGATE

Passing ¼-in. screen	100%
Passing 10-mesh sieve	75 to 95%
Passing 50-mesh sieve	5 to 25%
Passing 100-mesh sieve	0 to 5%
Removed by decantation not more than	2%

I am quite willing to admit that these requirements may be materially modified without injury to the resultant concrete and I have given them mainly for the purpose of illustrating about the minimum requirements of the grading of the particles necessary for a reasonably good grade of concrete.

In general, fairly strong concrete is desirable in road work for concrete structures and bases and is necessary for concrete pavements. Assuming the consistency of the concrete remains constant, its strength is dependent upon the amount of cement and the grading of the aggregates. If the grading of the aggregates is poor, more cement must be used. Well graded aggregates also reduces the cost of mixing and placing concrete, a fact often overlooked by the contractor.

Let me illustrate the effect of grading by referring to a certain contract with which I am familiar. On this contract, the contractor was laying a concrete base for a bituminous concrete pavement. The coarse aggregate first brought on the work by the contractor all passed a 2½ in. screen and 95% was retained on a 1½-in. screen. The grading of the fine aggregate

was very satisfactory. The mix was 1:2½:5. The contractor mixed 190 batches of concrete and laid 440 lin. ft. of base per day. The concrete, however, when tested showed a compressive strength of only 1400 lb. per sq. in. A 2000-lb. per sq. in. concrete was specified, and the contractor was advised that he must add more cement or secure a better graded coarse aggregate. He secured a well graded aggregate, with the result that 190 batches then laid 500 lin. ft. of base, instead of 440, and the resultant concrete had a strength of 2000 lb. per sq. in., although the amount of cement used per batch remained the same. As a result, the contractor saved not only 12% of the cost of cement, but 12% on the cost of mixing and placing the concrete, and an increase of 43% in the strength of the concrete was secured.

The loss to the contractor and the state, in using this poorly graded aggregate, would have been very much greater than were the profits of the producer on the amount of fine gravel taken out for sale for gravel road maintenance.

The Trend of Specifications

The trend of specifications for concrete work is now to specify that the concrete shall have a certain strength. Should such specifications become generally adopted, contractors will be more particular as to the qualities of the aggregates they purchase. And the time may come, if we ever have a surplus of sand and gravel produced, that each carload will bear a card giving its analysis, just as each bag of fertilizer now sold has an analysis of the fertilizer painted on the bag.

Sand and gravel, as they occur in nature, like a great many other things, are not entirely suited to the uses of mankind, except to a limited degree, without going through a manufacturing process. The tree, as it stands in the forest, is not of much service to us; but when sawed into lumber and put through various manufacturing processes, it serves us well in thousands of ways. Many machines have been devised and much thought given to the manufacturing processes in order that the manufactured articles may be well and cheaply made.

From Saw Log to Furniture Stage

I am not sure that the producers of sand and gravel have given as much thought as they should to producing a really manufactured product. Too often, their product as put on the market bears about the same relation to the material as it occurs in nature as the saw log does to the tree. A few have reached the rough lumber stage. What the engineers would like is for all to reach this stage and a few to get into the Chippendale furniture stage. We realize that a really manufactured product will cost more per unit, but if it is worth more we are entirely willing to pay more. In the illustration referred to above, it would have been a good investment for the contractor to have paid $1 per ton for the well graded aggregate, rather than to have accepted the poorly graded aggregate as a gift.

A suggestion at this time may not be out of place. If the producers wish to increase the amount of commercial sand and gravel used in road work over that now used, it can be easiest done by placing on the market a manufactured article considerably superior in quality to that found in local deposits. A little missionary work, too, may have to be done among the engineers. This missionary work, however, is now being ably conducted by such investigators as Prof. Duff Abrams, of the Lewis Institute, Prof. Talbott, of the University of Illinois, Mr. Goldbeck, of the Bureau of Public Roads, and many others connected with state and university laboratories.

Gravel roads, of which there are now more miles in the United States than of any other type, have generally been built of local materials with but little manipulation of the materials to improve them. As a result, we have great variations in the quality of our gravel roads, some being practically sand clay roads, some boulder roads and the others somewhere in between. Experience has indicated, however, that gravel for an excellent gravel road must approximately meet the following requirements:

Passing 1-in. screen	100%
Passing 8-mesh sieve	15 to 25%

The gravel road has been and must remain a relatively cheap road to construct. Its maintenance is fairly high and if it cannot be constructed at a very moderate cost, some other type of surfacing will be found to be more economical. So it would seem that we must continue to depend upon local deposits and adopt such means as screening and crushing locally to give as satisfactory a product as can be secured at a reasonable cost. A few states have developed the maintenance of gravel roads to a fine art with correspondingly excellent results. To secure these results, considerable care has been exercised in selecting the material which is necessarily added from time to time to the road. This maintenance gravel must generally meet the following requirements:

Passing ¾-in. screen	100%
Passing 8-mesh sieve not more than	25%

From 100 to 500 yd. of such material is required each year to maintain properly each mile of gravel road. It is the finishing course, so to speak, and those in charge of maintaining gravel roads are justified in paying a fairly good price for it. Here it would seem is a market for commercial plant material, for it cannot be obtained economically from local pits in the small quantities desired.

We are now engaged in building a great transportation system for this country—we as engineers and you as producers of materials. And it goes without saying that co-operation is desirable and necessary if the best work is to be done for the least cost. We as engineers are willing to co-operate by making investigations to ascertain how we can successfully use the materials you can most easily produce and we hope you will co-operate in producing the quality of materials found necessary for good work.

Election of Officers for 1924

New President Urges More Promotional Work

CHAIRMAN DANN: Gentlemen, we will now proceed with the election of officers for the ensuing year.

MR. CHANDLER: Mr. President, the nominating committee wishes to present the nominations as follows:

For President—John Prince, Stewart Sand Co., Kansas City, Mo.

Vice-President — E. Guy Sutton, Carmichael Gravel Co., Danville, Ill.

Secretary-Treasurer—J. L. Shiely, J. L. Shiely Co., St. Paul, Minn.

On behalf of the board of directors, I move you that these men be elected.

CHAIRMAN DANN: You have heard the report of the nominating committee, which has been moved for action. Is there any discussion?

MR. CHANDLER: Mr. Chairman, might we include the directors-at-large at the same time? They are Harry Donnelly, J. E. Carroll and Alex Dann.

(The above were unanimously elected.)

CHAIRMAN DANN: It is with a great deal of pleasure and with anticipation of the fine work which he will do for the association, this anticipation based upon a review of his record in the past with this association, that I invite Mr. Prince to take the chair.

MR. PRINCE: I have only one or two thoughts in connection with the coming year. It will be difficult to live up to Dann or to Johnson, who preceded him, particularly as I will not have the time at my disposal that perhaps both of those men have used.

There are one or two things which I think we should do, particularly at the next convention. I think we should have a regularly organized crops of sergeants-at-arms to round up the membership and have the sessions start on time. I do not know whether we can get men who will be willing to serve in that capacity, but next year we will try and do that, and they will have other duties as well.

We have before us a year that gives considerable promise and can develop to the good of the organization. I hope that much of our troubles with the railroads are passed,

and that we have reached the point where we can give primary attention to some of the things which concern every producer.

I have in mind particularly the promotion of the use of sand and gravel. I hope that this promition will go along the lines that Colonel Boyden showed us this morning. There is a great deal to be done on our part in preparing our products in such a way that they can be economically used. I think the cement association has shown the way to increase the use of their materials. They first tried to make the use of their materials economical and, at first instance, it looked as though this reduced the use of their material, but in the long run this was not the case. We have much the same problem. We are not as far advanced; we are not making as acceptable and not as uniform a product as the cement association has succeeded in making their material.

I happened to be in the cement business, in the production end, for 10 years, a good many years ago, and I know the progress that has been made in the cement industry since 1900, when I was actively engaged in the production of cement. The standards which they have now were unknown at that time.

I would like to tell you of an incident that is amusing: At one time I was operating a plant in New York state, and, at that time, we produced three brands of cement, one of them portland cement, not as good as produced today, but still portland cement. In the second place, we had a special brand, one which contained 50% ground limestone, and the third brand included the mixing of three-quarters of ground limestone; we sold the product with three-quarters ground limestone and one-quarter of portland cement.

J. L. Shiely
Newly Elected Secretary-Treasurer

That has all disappeared from the industry today, and it is due to the work of the Portland Cement Association. We have much to do to bring our product up to a point where it can be depended upon for uniformity and proper results.

E. Guy Sutton
Newly Elected Vice-President

I appreciate very greatly the compliment you have paid me and I only hope that at the end of the year I will have your equal confidence. I thank you.

Report of Program Committee

Activities Planned for 1924

CHAIRMAN PRINCE: The by-laws provide that the board of directors shall, at the annual convention, propose a plan covering the activities of the association for the ensuing year. The directors met on Monday and prepared such a plan. If you agree to the plan, you will have no further crticism for the coming year, so you had better give attention to it. Mr. Ross was chairman of the sub-committee appointed to put it in shape, and I would like to have Mr. Ross present the program.

MR. ROSS: The following recommendations were made by the board of directors. There are nine recommendations, and I will read them one at a time.

1. That strict economy be practiced in the affairs of the association.

2. That the executive committee be instructed to name four cities, which shall include the city selected for the national road show, and take a referendum vote of the membership as to their choice of one of those four cities as the place of the next annual convention of this association; and that manufacturers be encouraged to exhibit their products at future conventions of our association.

MR. SHIELY: I would like to amend that, inviting manufacturers to send their engineers to our convention.

MR. FLETCHER: Mr. Chairman, while I had something to do with this resolution, a thought came to me, and I would like to have it considered. It might be that these manufacturers or these men representing the companies get a good many of our members sitting out in the lobby, taking up their time, talking their machinery, when they ought to be in the meeting.

CHAIRMAN PRINCE: This is a distinct departure from the policy followed by the association heretofore. The association has never encouraged—although they have been glad to have those come who cared to come—manufacturers and their agents to attend the convention, and it should be thoroughly discussed before final action is taken. Is there any further discussion?

MR. BRADLEY: I suppose the greatest convention held along the railway lines is the Railroad Master Mechanics convention and they invite all members of the Railroad Manufacturers Association to come, but the members of the association are loyal enough to attend the meetings and then talk to the men on the outside. They try to hold the people in the meeting, and they do hold them, as a general thing. Loyalty is one thing and disloyalty is the

J. E. Carroll
Newly Elected Director

other. If you have to drive everybody in that isn't loyalty. If he is loyal, a member will be right here.

CHAIRMAN PRINCE: In one convention I know of, they have exhibits in a separate room, and that room is closed during the sessions of the convention. I do not know whether that could be worked out, but that is one method. Is there further discussion?

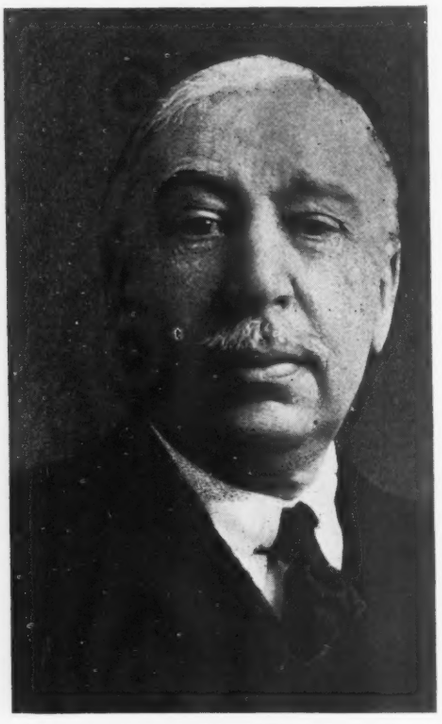
MR. FLETCHER: That would meet with my approval, if that could be worked out, to have the exhibit room closed during sessions. I would like to have that incorporated in the motion.

CHAIRMAN PRINCE: I think that could be very possibly left to the administrative end of the association through its executive committee.

MR. ROSS: 3. *That membership be retained in the American Society for Testing Materials, to serve as a point of contact between the society and the chosen representative of the established sand and gravel industry in matters pertaining to specifications for and the encouragement of the use of high grade aggregates.*

MR. ROSS: The next recommendation is on railroad matters, divided into three separate parts.

4. (a) *To combat by the most effective means the enforcement of priority orders if*



C. A. Homer
Chairman of Committee in Charge of Convention Arrangements

issued again by the Interstate Commerce Commission.

(b) *To endeavor to have continued the combination rates now affected through the operation of "Kelly's Tariff 228."*

(c) *That the coal industry should be placed on the same basis as the sand and gravel industry, with respect to the payment of demurrage charges and also with respect to reconsigning privileges.*

MR. CARMICHAEL: Will you explain that second recommendation?

MR. ROSS: There has been some movement which we have been opposing for the last two years to do away with Kelly's tariff before the Interstate Commerce Commission; that is the tariff which gives us 30 cents off on a two-line haul.

CHAIRMAN PRINCE: There has been some thought that section (c) did not represent the thought of the membership, and now is the time to change that.

MR. CARMICHAEL: Why wouldn't it be well to change that to read that the sand and gravel industry be put on the same basis as the coal?

MR. McGRATH: I believe you should make the same rules apply alike to sand, gravel, stone and coal. I think the recommendation should read the same as the one adopted at Washington.

CHAIRMAN PRINCE: Does this depart from what was used last year?

MR. ROSS (reading): "That the coal industry should be placed on the same basis as the sand and gravel industry, with respect to the payment of demurrage charges, etc." We want to add the demurrage to the coal companies, make them pay demurrage the same as we do, rather than cut it off of us. That was the idea of the committee.

CHAIRMAN PRINCE: That takes one part of the question. Before the committee did not know whether they would try to get us placed on the same basis as coal or coal placed on the same basis with us. This makes it clear.

MR. ROSS: 5. *That promotional work be undertaken by putting in operation an educational campaign covering the production and use of sand and gravel, and that the National Sand and Gravel Bulletin and the Bulletin Supplement be used for this purpose, and that their scope be widened so that they may reach architects, engineers and others who direct the making of specifications.*

MR. CARMICHAEL: Mr. Chairman, would it not be well, as a part of this campaign of publicity and improvement, to have an exhibit at the annual meeting of the good roads authorities, at Chicago or wherever it is held, and also at the American Society of General Contractors? Now the manufacturers of a number of other basic materials are so represented, by photographs, by samples and by photographs of plants and of deposits, and a general explanation of the characteristic materials in which they deal. That would be valuable, it seems to me, in the way of showing the public the value of graded and manufactured materials as compared with the ordinary pit run and other inferior materials that are used.

CHAIRMAN PRINCE: The executive committee have under consideration but have not yet taken action on the production of a film which will exploit washed and graded materials for concrete. Such a film, if it were produced, might be just the exhibit that Mr. Carmichael refers to, to be shown before the Good Roads Association and the Association of Contractors, if that became desirable and expedient.

MR. ROSS: That is our next recommendation.

CHAIRMAN PRINCE: So we have an-

Harry Donnelly
Newly Elected Director

other recommendation which specifically covers that.

MR. ROSS: 6. *That at the discretion of the executive committee, a film be produced entitled, "The Story of Sand," or some other suitable subject.*

7. *That a committee be appointed by the president to investigate conditions surrounding the problems of depletion and depreciation, and that the information be submitted to the executive secretary and made available to the members in the Washington office of the association.*

8. *That the present rate of assessment obtain for the ensuing year.*

[All of the above recommendations were adopted as read.]

Resolutions Passed

CHAIRMAN PRINCE: If there are no additional recommendations, the next order of business will be to hear the report of the resolutions committee. Mr. Haddow, are you prepared to report?

MR. HUGH HADDOW: The first resolution to be offered is one which is asked for by the legal department, as it has to

do with a legal matter with reference to the incorporation of this association.

[This resolution (1) was a long one and was passed to make the transfer of assets of the old association to the new incorporated association. The change has already been explained in this paper.—Ed.]

(2) "WHEREAS, President Calvin Coolidge, in his first message to Congress, has declared that no expenditure of public money contributes so much to the national wealth as for building good roads; and

"WHEREAS, The federal-aid road law and federal highway appropriations have been the stimulating force behind the country's effort to provide adequate and needed highways, both as a measure of national defense and facility of commercial transportation; and

"WHEREAS, The appropriations thus far made by the government have been wisely expended by the Bureau of Public Roads, under the direction of Thomas H. MacDonald, in co-operation with the states; and

"WHEREAS, The three-year program of appropriations and construction as now established by law terminates on June 30, 1925; and

"WHEREAS, The continuation of the present policy and construction is dependent upon suitable action by the Congress of the United States during its present session; therefore be it

For the Dowell Bill

"RESOLVED, By the National Sand and Gravel Association, Inc., in regular session at its eighth annual convention in the city of St. Louis, Mo., this 22nd day of January, 1924, that it does hereby respectfully urge that the Congress of the United States, at its present session, pass the Dowell bill providing for a three-year federal-aid program beginning July 1, 1925; and be it further

"RESOLVED, That the executive secretary of this association is hereby instructed to forward a copy of this resolution to each member of the roads committee of the House of Representatives and the committee on post offices and post roads of the Senate."

(3) "WHEREAS, The members of the National Sand and Gravel Association have received a satisfactory and adequate car supply during the 1923 shipping season; and

"WHEREAS, An equitable distribution of open-top equipment has been maintained throughout the year, despite an unusually heavy movement of coal during the summer months; and

"WHEREAS, This aforesaid equitable distribution of open-top equipment is attributable to the intelligent and efficient methods of the railroads, members of the American Railway Association and to the supervision exercised by the Car Service Division of that association; now therefore be it

Thanks the Railroads

"RESOLVED, By the National Sand and Gravel Association, Inc., in regular session at its eight annual convention in the city of St. Louis, Mo., this 22nd day of January, 1924, that it expresses its appreciation of the efforts of the American Railway Association to distribute evenly open-top cars among all industries dependent on this type of equipment for the transportation of their products; and be it further

"RESOLVED, That the executive secretary of this association is hereby instructed to spread a copy of this resolution on the official minutes of the organization, and to send copies thereof to Mr. R. H. Aishton, president of the American Railway Association, and to Mr. M. J. Gormley, chairman of the Car Service Division."

MR. SHIELY: I believe we have so much in common with the railroads that it would be a good thing, at the same time, to commend them for the service which they rendered during the year 1923, expressing to the railroad executives and the railroad officials the thought that this association is squarely behind the railroads in their efforts to increase the ability of the railroads to handle the traffic.

MR. POTTS: I think Mr. Shiely's remarks are especially timely, and I wonder if, at this late date, a motion would be in order that that committee, of which Mr. Haddow is chairman, be instructed—without further submitting to this body—to add a resolution exactly along the lines Mr. Shiely suggested. I move you that a committee be instructed to draw up a resolution in line with the remarks made by Mr. Shiely, that this be done, because you cannot give car service unless you move them over the rails, and that is what has been done.

Most Successful Convention

(4) "WHEREAS, It is the unanimous opinion of the members of our association in attendance at this convention that the meeting has been one of inestimable value and pleasure and that the convention has been the most successful of any in the history of the organization; now therefore be it

"RESOLVED, By the National Sand and Gravel Association, Inc., in regular session at its eight annual convention in the city of St. Louis, Mo., this 22nd day of January, 1924, that a vote of thanks is merited and is hereby extended to the committee in charge of the convention arrangements, of which Mr. C. A. Homer, vice-president of the Missouri Portland Cement Co. is chairman; and be it furter

"RESOLVED, That the executive secretary is hereby instructed to spread a copy of this resolution upon the permanent records of the association."

CHAIRMAN PRINCE: Is Mr. Homer in the room? I would like to have him stand up. Mr. Homer, we are just now adopting a resolution of thanks to you and your committee for the successful convention which has just been held. All those in favor of this resolution please say "Aye;" contrary, "No."

MR. HOMER: I think the association's secretary should be included, as he did most of the work. We are very glad to have done our part. I am very glad to know that the delegates had a good time, and were well taken care of. If there is anybody here, however, who has not been taken care of, we will be glad to give him that care. (Applause.)

(5) "WHEREAS, Alex W. Dann, as president of this association for the past two years, has given unstinted time and thought to advancing the best interests of the organization; and

"WHEREAS, The said Alex W. Dann has labored energetically toward promotion of the principles upon which our association is founded; and

"WHEREAS, It is the wish of the members of this association to bear testimony to their appreciation of the invaluable services which the said Alex W. Dann has rendered in their behalf; now therefore be it

"RESOLVED, By the National Sand and Gravel Association, Inc., in regular session at its eighth annual convention in the city of St. Louis, Mo., on this 22nd day of January, 1924, that it does hereby acknowledge its deep indebtedness to Alex W. Dann, and gratefully takes advantage of this opportunity to express its feeling of obligation; and be it further

"RESOLVED, That the executive secretary is hereby instructed to spread a copy of this resolution on the permanent records of the association."

CHAIRMAIN PRINCE: We have extended to you our thanks, Mr. Dann, and we would be glad to hear from you.

MR. DANN: All I can say is that I thank you very much. After passing these resolutions the convention enjoyed an exhibit of moving pictures and then adjourned.

At Mr. Homer's invitation a number of members visited the gravel plant of the Missouri Portland Cement Co. on the following day.

Oklahoma Gravel Plant Sold—Will Be Enlarged

A DEAL which threw the Muskogee, Okla., Sand and Gravel Co., a $50,000 corporation, into the hands of O. M. Drake and John L. Walker was made public recently.

The plant, located three miles northeast of Fort Gibson on the Grand river, was sold by R. T. Price, H. C. Croft, Jr., M. G. Young, and G. C. Jackson.

The capacity of the plant will be enlarged one half and storage facilities will be added so that during high water times, shipping may be continued. For several years when the river was high it was virtually impossible to get the gravel to the contractors.

Drake is president and manager of the company. Walker lives in Chicago.—*Muskogee, Okla., Phoenix.*

Secretary's Annual Report for 1923

By T. R. Barrows
Executive Secretary, National Sand and Gravel Association

[The full text of this report will be found in the February issue of the National Sand and Gravel Bulletin, the official organ of the assocaition.—Ed.]

THE year 1923 has been a record-breaking one for the sand and gravel industry so far as volume of production is concerned. At the outset of the business season of the members of the National Association, we made the prediction that, barring interruptions through strikes or priority orders, the sand and gravel industry would have a year of maximum activity, and this prediction has been fully sustained.

For the first time during any of the post-war years, the sand and gravel industry has been permitted to function without burdensome regulations from Government agencies or the interjection of artificial factors into the distribution of open top equipment among industries which depend on such equipment for the transportation of their products. Generally speaking, the members of the National Association have no complaint with respect to car supply during the past year. An even distribution of open top equipment has been maintained throughout the year, despite the fact that the summer months witnessed an unusually heavy coal movement.

The satisfactory results which have been secured by our members this year as to car supply are attributable to the intelligent and efficient methods of the car service division of the American Railway Association. In submitting his report your executive secretary desires to bear testimony to the sincere co-operation which has been extended to the National Association at all times by W. J. McGarry, manager of the open top car section of the car service division. We have submitted to Mr. McGarry during the course of the year numerous cases of car shortages which had been reported by members to the Washington office. On each occasion, he has taken prompt action to afford relief and difficult situations have been adjusted in an expeditious manner.

The members of the National Association have suffered severe injuries in the past through transportation shortages. But the main periods of difficulty are found in 1920 and 1922, when the Interstate Commerce Commission issued priority orders turning over transportation facilities to the movement of coal. The damage inflicted on our industry during the two years in question is incalculable, but it is a thing of the past now, and our efforts should henceforth be directed at preventing repetition of the conditions which encouraged the Interstate Commerce Commission to assume arbitrary control of the carriers. We can best do this through co-operating with the railroads in their appeals for securing the fullest posible use of transportation equipment. It is appropriate to state here that the National Association worked along these lines during 1923.

At the Washington convention, the Board of Directors laid out a program of activities for the National Association during the ensuing year. In order that this report, then, may be complete, it is well to recite the efforts made by the executive committee and the executive secretary to carry out to the fullest possible extent the expressed instructions of the board of directors.

Economy

As to the observance of the recommedation for economy of the program, we believe the record speaks for itself. The report of the treasurer will show a surplus in excess of all liabilities. No new indebtedness has been incurred; nothing has been undertaken when it was not assured in advance that ample funds were available to meet promptly the resulting obligations. The principle of strict economy has not reacted to decrease the useful work of the association, and there have been sufficient funds to carry on the efforts of the organization.

Place for Annual Meeting

Pursuant to this instructions the executive committee selected St. Louis as the site of the eighth annual convention.

Membership in American Society for Testing Materials

The executive committee, realizing the necessity of continued affiliation with the American Society for Testing Materials, appointed E. Guy Sutton, vice president of the Carmichael Gravel Co., as the official representative of the National Association. Mr. Sutton has attended all meetings of committees of the society which have to do with specifications for sand and gravel. Through him, the Association has communicated to this important agency the viewpoint of the established sand and gravel producer, which has been taken into consideration in the development of specifications. It is impossible to over-estimate the benefits derived by members from this contact, for they are thus assured that nothing will be done by the society which is ill-advised as to sand and gravel and which will jeopardize their interests.

Transportation

Owing to the limited time which has transpired since the opening of the Sixty-eighth Congress, it has not been possible as yet to secure the reintroduction in the House of Senate Bill 690, which, as will be recalled, would abolish the Interstate Commerce Comission's privilege to issue priority orders.

Priority Orders

There have been no priority orders, ofcourse. It seemed possible at times during the year that an outgrowth of the coal strike would be the issuance of such orders. The Washington office maintained a daily contact with the commission and members were advised that the orders would be avoided, although they were informed early in February that 1923 would witness a tightening up in car supply for the sand and gravel industry and that at no time would there be an open top car surplus such as is ordinarily had in summer months. Acting upon this conviction, the Washington office suggested to members the advisability of starting operations as early as practicable and also that they institute individual campaigns, supplementary to the general program of the National Association, for encouraging the early movement of sand and gravel. A gratifying response was had, and the beneficial results which flowed therefrom were inevitable.

Regarding combination rates effected through the operation of Kelly's tariff 228, this tariff has not been canceled and, therefore, the combination rule named therein is still in effect. The National Association has kept closely in touch with the tariff section of the Interstate Commerce Commission and if the carriers attempt to withdraw the application of the combination rule, we shall promptly petition the commission to prevent such action.

The National Association has secured an understanding with the Interstate Commerce Commission that it will not permit cancellation of the rule in any instance where the cancellation means an increase in present rates. The Commission, however, will permit the carriers to cancel the rule if ample notice is furnished the shipping public of their intention to do so, and provided further that the railroads, upon request from shippers, establish a line of through rates or proportional

rates which will continue the present basis in effect.

Under the national car demurrage rules, coal mines and coke ovens are granted exemption from demurrage charges. They are thus permitted to hold open top equipment for indefinite periods without suffering the demurrage penalties which would be levied on the sand and gravel industry under like circumstances. This has the effect, especially at times of car shortage, of penalizing other industries which depend on open top equipment for the transportation of their products.

There will be no attempt in this report to detail the National Association's efforts to secure equalization of the demurrage rules. Members are well aware of the many facts which have been presented to justify an amendment of the present rules. At a meeting of the executive committee on September 27 last, the executive committee appointed the following sub-committee to represent the National Association at the prospective hearing before the railroad authorities: T. E. McGrath, McGrath Sand & Gravel Co., chairman; Frank W. Renwick, Chicago Gravel Co.; E. Guy Sutton, Carmichael Gravel Co.; and the executive secretary. The continuation of efforts toward securing amendment of the demurrage rules will depend on the action of the convention.

The executive committee, convinced that promotional work designed to emphasize the importance of using properly prepared sand and gravel should be an outstanding activity of the National Association, has concentrated its greatest efforts toward fulfilling this phase of the program for 1923. President Dann aptly stated the policy of the National Association in this respect at the seventh annual convention; "It is the fixed policy, and always has been, of this association and of its membership to advocate the production and sale of the very finest material available." The members of the National Association are established producers of sand and gravel, with reputations to sustain and investments to safeguard. We are opposed, therefore, to the wayside pit which produces an inferior material. E. W. James, assistant chief engineer of the Bureau of Public Roads, in outlining the policies of the bureau at our last convention, stated that "The use of the roadside material is one of the things we are having a great deal of trouble with right along." The National Association, then, has the support of the greatest road-building organization in existence, and we are encouraged to believe that eventually the results of our promotional work will result in a country-wide acceptance of the fact that sand and gravel must be scientifically treated before being used as concrete aggregates.

During the course of the preliminary work on an important building project of the government, the Washington office was informed that wayside pit materials were being used in the concrete work. An investigation disclosed that this was contrary to the specifications which called for suitable materials. The matter was then called to the attention of the proper authorities, who ordered the discontinuance of the inferior materials and the substitution of materials furnished by one of our member concerns. This case is cited as an illustration of what the Washington office is doing in the way of individual promotional work.

Your executive secretary has submitted to the executive committee an outline of a proposed motion picture film to be entitled "The Story of Sand." The scenario has been prepared with the assistance of experts and, at the proper time, the film may be produced at a reasonable cost.

Another feature of promotional work is the display advertising carried in many local papers by members, pointing out the necessity of using properly prepared materials and the danger which lies in the use of inferior materials. The executive committee has encouraged such advertising by all members, for this is a most effective way of getting our message to the public. Our position is sound when we advocate the use of clean materials, for government bodies, professional organizations of repute, and scientific societies have repeatedly asserted that dirty materials mean unsafe construction. Fortified with these facts, we must exert every possible effort toward giving the widest publicity to the standard products of the members of the National Association.

The Bulletin

The *Bulletin* established a record during 1923 in that it has been self-supporting.

The *Bulletin supplement* has been continued and its scope broadened to cover every phase of the sand and gravel industry. It has been published regularly each week and has been mailed only to members. Through this medium, the association has been able to keep members accurately posted on all questions which have a direct influence on their business, such as orders of the Interstate Commerce Commission, the Bureau of Internal Revenue, the American Railway Association, the Department of Commerce, and other agencies.

Cost Accounting System

The general use of a cost accounting system, embracing all items of cost, by the members of the National Association, was recognized by the executive committee as a primary need. At the first meeting of the committee, Hugh Haddow, Jr., of the Menantico Sand & Gravel Co., was appointed chairman of a sub-committee on cost accounting and charged with the duty of preparing a uniform cost accounting system in line with the instructions of the board of directors.

Mr. Haddow enlisted the aid of a representative number of members in different sections of the country in order that he might be fully informed as to operating conditions generally before undertaking the preparation of a uniform cost system. As a result of his studies, a system which comprehends all items of cost has been prepared and will be distributed among all members for their adoption.

It is hoped that all members will take advantage of this uniform system. It provides a sure method of intelligent figuring of costs and will assuredly result in a better-informed competition within the industry. In addition, it facilitates the preparation of income tax returns and insures an accurate check as to the condition of a member's business, whether taken from the standpoint of a year's operation, a month's operation, or even a day's operation.

Depreciation and Depletion

This matter has had the consideration of the executive committee and preliminary investigations have been made as to the possibility of drawing up a standard scale of depreciation and depletion rates. However, it was discovered that a large number of members felt that the value of such a scale would not be commensurate with the time and effort which would be necessary for its preparation and final approval by the Treasury Department. It was also contended that the widely diversified methods of operation in the industry in different sections of the country would practically prohibit the establishment of a standard scale which would be workable and satisfactory to the membership as a whole.

Service to Members

The service rendered by the National Association to the membership may be divided into two classes: general and specific. The former refers to those activities of the association in which the entire membership is affected; the latter refers to individual cases which the association handles at the request of members, as, for instance, car supply, income tax, and the like. The benefits which have been received by members through the handling of such specific cases is attested by the many expressions of appreciation received at the Washington office.

Through an arrangement made by the executive secretary, the National Association is in a position to render, and is rendering, expert advice on income tax problems of the members. A specialist on income tax matters is on the consulting staff of the association and every recommendation made by the Washington office to members first receives his approval. At the present time the Washington office is handling several income tax cases for members with the Treasury Department and satisfactory results are being secured.

An effort has been made by your execu-

tive secretary to develop fully the specific service feature of membership in the National Association. We are encouraged to believe that this privilege of affiliation with the association is one which is rapidly receiving more recognition. The broad scope of the services which have been rendered in this way indicates that we have the organization which can meet the maximum demands from the membership for specific service, and it is hoped that in the future members will more fully utilize the resources of the association.

Recognition of the Industry Secured

The National Association has undoubtedly brought about official recognition of the industry as a legitimate, necessary business, engaged in by men of reputation and worthy of being accorded consideration on an equal plane with other essential factors in the construction world. It is not difficult to see the value of the industry's being able to speak as one voice to governmental bodies, railroad associations, and other organizations which have to do with matters concerning the industry. Individual action is more or less abortive; it is imperative that a national organization of producers be in existence to preserve the interest of the established sand and gravel industry.

The National Association is growing in importance; its membership is steadily increasing; its financial condition was never better; its future possibilities are unlimited. These being self-evident facts, your executive secretary feels justified in reporting that the year 1923 has been a successful one for the National Association and that the outlook for 1924, both for the industry and the organization, is most promising.

Those Who Were Present

FOLLOWING is a list of producers and visitors in attendance at the St. Louis convention:

Producers Present

Joseph C. Aldous, Mississippi Lime and Material Co., Alton, Ill.
David Alexander, Petersburg Sand and Gravel Corp., Petersburg, Va.
C. M. Ault, The Barnes Sand and Gravel Co., Piketon, Ohio.
E. S. Baker, Baker Gravel Co., Noblesville, Ind.
H. N. Battjes, Grand Rapids Gravel Co., Grand Rapids, Mich.
C. G. Besch, Missouri Portland Cement Co., St. Louis, Mo.
J. H. Black, Estill Sand and Gravel Co., Estill Springs, Tenn.
H. L. Bible, Alabama Sand and Gravel Co., Montgomery, Ala.
Charles P. Biesanz, Biesanz Stone Co., Winona, Minn.
J. B. Blanton, J. B. Blanton Co., Frankfort, Ky.
Scott Bond, Crook Gravel and Sand Co., Madison, Ark.
G. H. Boynton, Northern Gravel Co., Muscatine, Iowa.
W. Frank Bradley, Ohio-Michigan Sand and Gravel Co., Toledo, Ohio.
Guy C. Baker, Greenville Gravel Co., Greenville, Ohio.
J. C. Brandt, Lincoln Sand and Gravel Co., Lincoln, Ill.
J. A. Bullen, Fountain Sand and Gravel Co., Pueblo, Colo.
A. P. Burke, Atlanta Sand and Supply Co., Atlanta, Ga.
A. C. Butterworth, Southern Sand Co., Little Rock, Ark.
H. P. Caldwell, Ohio River Sand Co., Louisville, Ky.
R. S. Campbell, Holston Quarry Co., Knoxville, Tenn.
J. P. Cantlon, Neal Gravel Co., Mattoon, Ill.
W. P. Carmichael, Carmichael Gravel Co., St. Louis, Mo.
J. E. Carroll, J. E. Carroll Sand Co., Buffalo, N. Y.
J. M. Chandler, Price Sand Co., Tulsa, Okla.
H. W. Christy, St. Louis Material and Supply Co., St. Louis, Mo.
J. G. V. Clarke, Clarke Rock and Gravel Corp., Los Angeles, Calif.
H. D. Clouse, Lincoln Sand and Gravel Co., Lincoln, Ill.
W. H. Collins, Spruce Pine Sand and Gravel Co., Spruce Pine, Ala.
C. C. Collmus, Jr., Hampton Roads Sand and Gravel Corp., Norfolk, Va.
Geo. H. Cook, Stewart Sand Co., Kansas City, Mo.
Otto S. Conrades, St. Louis Material and Supply Co., St. Louis, Mo.
V. A. Cordes, Wolf River Sand Co., Memphis, Tenn.
C. W. Crisler, Potts-Moore Gravel Co., Waco, Texas.
Alex W. Dann, Keystone Sand and Supply Co., Pittsburgh, Pa.
A. B. Davis, Davis-Haddon Sand Co., Omaha, Nebr.
H. S. Davison, J. K. Davison & Bro., Pittsburgh, Pa.
Edw. Donnelly, The Ohio Gravel Ballast Co., Cincinnati, Ohio.
L. E. Duvall, Sabula Sand and Gravel Co., Sabula, Iowa.
A. E. Fisher, Glasgow Sand Co., Glasgow, Mo.
R. C. Fletcher, Flint Crushed Gravel Co., Des Moines, Iowa.
F. C. Fuller, Portsmouth Sand and Gravel Co., Portsmouth, Ohio.
Roy P. Eastland, Texas Sand and Gravel Co., Waco, Texas.
R. H. Eastwood, R. H. Eastwood Sand and Gravel Works, Grayville, Ill.
D. J. Ellingen, H. D. Conkey and Co., Mendota, Ill.
N. J. Eschenburg, St. Louis Material and Supply Co., St. Louis, Mo.
Gaylord E. Gray, Des Moines Sand and Fuel Co., Des Moines, Iowa.
V. M. Haddon, Davis-Haddon Sand Co., Omaha, Nebr.
Hugh Haddow, Jr., Menantico Sand and Gravel Co., Millville, N. J.
F. E. Hall, T. J. Hall and Co., Cincinnati, Ohio.
N. R. Halliday, H. H. Halliday Sand Co., Cairo, Ill.
H. H. Halliday, H. H. Halliday Sand Co., Cairo, Ill.
C. A. Homer, Missouri Portland Cement Co., St. Louis, Mo.
V. O. Johnston, Lincoln Sand and Gravel Co., Lincoln, Ill.
Jos. E. Lloyd, E. T. Slider Co., Louisville, Ky.
F. A. Laughead, Topeka Sand Co., Topeka, Kans.
E. A. Lansrud, Independent Sand and Gravel Co., Des Moines, Iowa.
Thos. McCroskey, American Limestone Co., Knoxville, Tenn.
Jos. R. McGaw, Ohio River Sand Co., Pittsburgh, Pa.
T. E. McGrath, McGrath Sand and Gravel Co., Lincoln, Ill.
John McGuire, Missouri Portland Cement Co., St. Louis, Mo.
H. C. May, Caruthersville Sand and Gravel Co., Caruthersville, Mo.
Chas. H. Miller, Allen Gravel Co., Iuka, Miss.
H. Wm. Miller, Mississippi Sand and Gravel Co., Burlington, Iowa.
Rhea Miller, J. Fred Smith Gravel Co., Dallas, Texas.
E. H. Miller, Mississippi Lime and Material Co., Alton, Ill.
Harry E. Moore, Missouri River Sand and Gravel Co., Boonville, Mo.
J. W. Cuthier, Hamilton Washed Sand and Gravel Co., Hamilton, Ill.
F. W. Peck, Muncie Sand Co., Kansas City, Mo.
Robt. J. Potts, Potts-Moore Gravel Co., Waco, Texas.
W. H. Prentice, Potts-Moore Gravel Co., Waco, Texas.
John Prince, Stewart Sand Co., Kansas City, Mo.
E. J. Proctor, Genesee Gravel Co., Flint, Mich.
R. M. Quigley, Ft. Worth Sand and Gravel Co., Inc., Ft. Worth, Texas.
W. E. Rogers, Arkansas River Sand Co., Sand Springs, Okla.
G. C. Ross, Ohio River Gravel Co., Parkersburg, W. Va.
W. H. Rucker, New Hope Gravel Co., Columbus, Miss.
H. E. Schellberg, Lyman-Richey Sand Co., Omaha, Nebr.
W. G. Sessions, Golden Gravel Co., Golden, Miss.
J. A. Shearer, Indiana Gravel Co., Indianapolis, Ind.
J. L. Shiely, J. L. Shiely Co., St. Paul, Minn.
W. L. Smith, Memphis Stone and Gravel Co., Memphis, Tenn.
R. Snoddy, Coon River Sand Co., Des Moines, Iowa.
R. G. Smock, Cedar River Sand and Material Co., Waterloo, Iowa.
W. C. Roberts, Yourtee-Roberts Sand Co., Chester, Ill.
E. C. Sparrow, The Fountain Sand and Gravel Co., Pueblo, Colo.
H. B. Springer, Dixie Sand and Gravel Co., Chattanooga, Tenn.
Q. L. Slocumby, Missouri Portland Cement Co., St. Louis, Mo.
H. J. Stannert, H. J. Stannert Sand Co., Northumberland, Pa.
F. P. Steinberg, The Carmichael Gravel Co., Danville, Ill.
M. D. Sullivan, Chillicothe Sand and Gravel Co., Chillicothe, Ohio.
E. Guy Sutton, Carmichael Gravel Co., Danville, Ill.
W. G. Van Etten, H. D. Conkey and Co., Mendota, Ill.
J. H. Wagoner, Boonville Sand Corp., Boonville, N. Y.
Frank M. Welch, Greenville Gravel Co., Greenville, Ohio.
G. H. Williamson, J. K. Davison and Bro., Pittsburgh, Pa.
E. E. Woodson, Muncie Sand Co., Kansas City, Mo.
K. M. Wright, Gasconade Sand and Gravel Co., Arlington, Mo.
P. A. Yager, River Sand and Gravel Co., Owensboro, Ky.
C. H. Young, Landers, Morrison & Christenson, Minneapolis, Minn.
Chas. H. Young, Robbins-Young Co., Minneapolis, Minn.
L. B. Yourtee, Yourtee-Roberts Sand Co., Chester, Ill.
Earl Zimmerman, The Ohio Gravel Ballast Co., Cincinnati, Ohio.
C. S. Rogers, Buckhill Washed Sand and Gravel Co., Canton, Ohio.

Visitors Present

C. B. Andrews, Taylor-Wharton Iron and Steel Co., High Bridge, N. J.
W. H. K. Bennett, Chicago, Ill.
Col. H. C. Boyden, Portland Cement Association, Chicago, Ill.
Edwin Brooker, Traffic Counsel, Washington, D.C.
Bradley S. Carr, American Manganese Steel Co., Chicago Heights, Ill.
E. C. Crout, Columbia Digger Co., Portland, Ore.
C. L. Dake, Missouri School of Mines, Rolla, Mo.
A. W. Daniels, American Manganese Steel Co., Chicago Heights, Ill.
T. G. Davis, Chicago, Ill.
Elles R. Dutton, Minneapolis, Minn.
Geo. M. Earnshaw, Rock Products, Chicago, Ill.
John J. Fitzgerald, Pit and Quarry, Chicago, Ill.
Wm. H. Fowler, The Dravo Contracting Co., Pittsburgh, Pa.
H. E. Frech, Portland Cement Association, St. Louis, Mo.
W. J. McGarry, American Railway Association, Washington, D. C.
Abe Goldberg, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Harvey T. Gracely, Marion Steam Shovel Co., Marion, Ohio.
B. Haislip, Traylor Engineering and Manufacturing Co., Chicago, Ill.
F. B. Hanley, St. Louis, Mo.
E. S. Hanson, Cement, Mill and Quarry, Chicago, Ill.
H. W. Hendley, U. S. Bureau of Public Roads, Washington, D. C.
A. E. Holcomb, Koehring Co., Milwaukee, Wis.
C. S. Huntington, Link-Belt Co., Chicago, Ill.
H. E. Irvine, J. E. Irvine, General Contractors, Green River, Wyo.
W. E. Johnson, Missouri Valley Association, Kansas City, Mo.
Frank B. Kane, A. S. & W. Co., St. Louis, Mo.
Louis J. Kern, Broderick & Bascom Rope Co., St. Louis, Mo.
Arthur F. King, The Marion Steam Shovel Co., Marion, Ohio.
H. F. Lamwersiek, Broderick & Bascom Rope Co., St. Louis, Mo.
W. C. MacDowell, Traylor Engineering and Manufacturing Co., Allentown, Pa.
Edwin E. Mitchell, American Manganese Steel Co., Chicago Heights, Ill.
J. J. Moore, Thomas Elevator Co., Chicago, Ill.
Daniel J. Murphy, Pawling & Harnischfeger Co., Milwaukee, Wis.

P. J. Oestriecher, American Steel and Wire Co., St. Louis, Mo.
F. G. Pulley, Pit and Quarry, Chicago, Ill.
C. F. Rabbette, Railway Exchange Bldg., Koehring Co., St. Louis, Mo.
J. O. Reed, The Ohio Locomotive Crane Co., Bucyrus, Ohio.
J. W. Reed, Cincinnati Rubber Manufacturing Co., Cincinnati, Ohio.
Nathan C. Rockwood, Rock Products, Chicago, Ill.
G. W. Rockwell, Sunbury, Pa.
J. A. Schultz, Sauerman Bros., Chicago, Ill.
G. Schurmer, Blaw-Knox Co., Chicago, Ill.
Edmund Shaw, Rock Products, Chicago, Ill.
Fred Shattuck, Onley, Ill.
B. G. Shotton, Hendrick Mfg. Co., Pittsburgh, Pa.
E. M. Stephanus, Broderick & Bascom Rope Co., St. Louis, Mo.
R. Symons, Pit and Quarry, Chicago, Ill.
G. H. Tompkins, Sauerman Bros., Chicago, Ill.
J. W. Van Brunt, Jackson & Church Co., Saginaw, Mich.
E. A. Velde, Universal Crusher Co., Cedar Rapids, Iowa.
James T. Voshell, Chicago, Ill.
Wm. Wagener, A. Leschen & Sons Rope Co., St. Louis, Mo.
W. A. Warner, Shope Brick Co., Portland, Ore.
R. T. Whitney, The American Appraisal Co., Milwaukee, Wis.
Donald T. Wright, Editor, Waterways Journal, St. Louis, Mo.
Clark M. Young, Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
P. M. Zimmerman, Koehring Co., Railway Exchange Bldg., St. Louis, Mo.
A. P. McCallie, New York, N. Y.
H. M. Davison, The Hayward Co., New York, N. Y.

Directors' Meeting

THIS meeting of the directors of the National Sand and Gravel Association started at one o'clock Monday, January 21. It was nearly seven before President Dann announced its adjournment. There was the fullest and frankest discussion of the National Association's affairs from every angle. Directors were present at this meeting from nearly every one of the country's 26 districts and many other producers drifted in and became interested auditors.

The net results of the six hours' work were:

Selection from their own number of four members of the executive committee: H. B. Springer, Tennessee; Alex W. Dann, Pennsylvania; Hugh Haddow, Jr., New Jersey; R. C. Fletcher, Iowa.

Nomination of candidates for the offices of president, vice-president, and secretary-treasurer, and also for three directors at large.

President Dann appointed as a nominating committee, J. M. Chandler, Oklahoma; F. W. Peck, Missouri; H. B. Springer, Tennessee; G. C. Ross, West Virginia; J. E. Carroll, New York.

The committee retired and after due consideration reported their recommendations, as follows:

President, John Prince, Missouri.

Vice-President, E. Guy Sutton, Illinois.

Secretary-Treasurer, J. L. Shiely, Minnesota.

Delegates at large: Alex D. Dann, Edward Donnelly, J. E. Carroll.

The nominations were later unanimously confirmed by the convention.

Preparation of a plan of activities for the association during 1924, which will be found in the committee's report to the convention, was also discussed.

The board made certain recommendations which were adopted by the convention and which are given in the preceding pages.

Annual Banquet

THE annual dinner of the National Sand and Gravel Association was held in the roof garden of Hotel Chase and was a most enjoyable affair. Almost as many ladies as men were present and the dinner was a purely social function without "toasts" and set speeches. An excellent entertainment was furnished which included songs by an excellent quartette and soloists, and later the usual "jazzy" stuff. The roof garden has an excellent dancing floor and dancing was kept up until midnight.

Exhibits

ACCORDING to its usual policy, the association did not invite manufacturers to exhibits. This policy has been changed by a vote of this year's convention and next year it is expected that a number of manufacturers will make exhibits.

The American Manganese Steel Co. had a table on which was installed a full-sized sectionalized model of a sand and gravel pump and a small working model of a digging bucket, with wearing parts of manganese steel, as made by this company.

The American Association of State Highway Officials had an excellent exhibit in which were maps, pictures and literature.

Canada Good Roads Meeting

THE eleventh annual convention of the Canadian Good Roads Association will be held at St. Andrews-by-the-Sea, New Brunswick, June 24, 25, 26 and 27 next, according to official announcement made by the president, Russel T. Kelley, of Hamilton, Ont. The Algonquin Hotel, one of the finest summer hotels on the coast, will be specially opened for the convention ahead of its usual time, the Canadian Pacific Railway Co. placing the entire hotel at the disposal of the delegates and their wives and friends who will attend the convention from every part of the Dominion.

The association is dominion-wide in its scope and the convention is held every year in a different province, its object being to aid in educating the public as to the importance of improved highways. This is the first time New Brunswick has been visited, and delegates who participated in the visit to the neighboring provinces a few years ago need no reminder of the magnificent hospitality accorded by the Maritimes to visitors, and will undoubtedly seize the opportunity to pay another visit to the east with all its wonderful scenic and marine attractions.

The executive committee of the association, of which S. L. Squire, deputy minister of highways for Ontario, is chairman, is already at work on the program, which will be based largely on the practical work done by the members of the inter-provincial conference of highway officials held at Winnipeg recently.

Missouri to Build 150 Miles of Concrete Roads in 1924

A HIGH-WATER mark of state road building in Missouri was reached in 1923, when 533 miles of hard-surface highways were constructed, together with 757 miles of other roads that were graded preparatory to hard-surfacing. The total cost of the work was in the neighborhood of $14,000,000.

New work to be undertaken in 1924 includes 150 miles of concrete roads, estimated to cost $5,000,000, 500 miles of gravel road at an estimated cost of $5,000,000, and 300 miles of graded earth roads to cost about $2,000,000. Total commitments have been placed at $42,514,830.91.

In 1922 the present highway commission completed 498 miles of graded earth and 277 miles of hard-surface roads. A total of approximately $1,000,000 was spent for maintenance on the state road system in 1923.

Fifth Good Roads Essay Contest

A FOUR-YEAR term at college with all expenses paid is the inducement held out to high school students of the United States for the best essay on the subject, "The Relation of Improved Highways to Home Life," according to a statement of the Highway Education Board.

Announcement of this proposal is being made to all state, city and county school officials as promptly as possible. The offer is in the form of a content, in which all students of high school grade are eligible to compete. The four years at college constitute a scholarship given annually by H. S. Firestone, Akron, Ohio, for the best essay on a subject pertaining to elementary highway economics. The contest is the fifth conducted in as many successive years under the auspices of the highway organization.

In the conduct of the contest the board will have the active assistance of extension divisions of the leading universities in each state, or of the state departments of education, as well as the almost unanimous endorsement and support of city and county school authorities.

The rules of the contest are simple. Any student of high school grade is eligible to enter. Essays to be written must not exceed 700 words in length. The closing date on which essays must be presented to school principals is April 21, 1924. Aside from the usual statements that essays must be written on one side of the paper only, must be the original work of the writers, and that the decision of the judges is final, there are no other conditions.

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of the National Crushed Stone Association and National Sand and Gravel Association

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State Highway Work in Pennsylvania

THE state highway department of Pennsylvania during the past construction season has built 331 miles of durable thoroughfare by contract and has completed 31 miles of resurfacing for which contracts were let. The maintenance forces of the state highway department have completed the following resurfacing mileages on state highways: water-bound macadam, 394 miles; unbound macadam, 261 miles; concrete, 8 miles; bituminous macadam, 19 miles; of a total of 382 miles. The maintenances forces have completed the following state aid resurfacing mileages: waterbound macadam, 107 miles; unbound macadam, 264 miles; concrete, 8 miles; bituminous macadam, 21 miles; or a total of 400 miles.

During 1924 the state highway department hopes to build 900 miles of durable roads. It also will undertake a larger maintenance program than heretofore.

To Make Cinder Concrete Blocks

AN industry that has been known for the past 35 years has been revived, that of making cinder concrete blocks from coal clinker. Jeremiah C. Finch, formerly secretary of the state highway commission of New York, and Wm. L. Ostrander, formerly first deputy in the same department, are partners in the firm for the production of this brick. The firm plans to supply contractors in towns along the New York barge canal, and will use the canal for all its shipping.—*Highway Builder.*

Bellefonte, Pa., Stone Plant Enlarges

NEW equipment costing approximately $17,000 has been ordered by the Whiterock Quarries Co. of Bellefonte, Pa., for putting the plant at Pleasant Gap into more efficient operating shape. The new conveyor is about completed and new workmen have been employed the past week increasing the force from 100 to 200. The capacity will be increased from an output of 10 cars to 20 cars daily. Forty new quarry cars have been purchased and 25 more are to be ordered in the near future. This will give the company over 200 quarry cars. A new air compressor is to be installed at a cost of $9000. The new manager, Ray Noll, is ambitious to secure more local business and is very optimistic of the present outlook.

Very High Grade Marl Analysis Reported

A DISPATCH from Sheffield, Ill., to the Peoria *Journal* says that results of the analysis made of samples of native marl found on the farm of Anton Nordstrom of Tiskilwa have been received. The light colored marl tested 92.2% calcium carbonate.

Chemistry and the Portland Cement Industry*

Chemical Industry Defined—Cement Manufacture Is a Chemical Industry

By J. C. Witt, Ph.D.
Member, American Society of Mechanical Engineers

THE development of the portland cement industry has involved the co-operation of many professions and trades, and many branches of science have contributed. For example, mechanical engineering has been indispensable, because the industry as we know it today could not exist without such mechanical devices as crushers, grinders, conveyors and the rotary kiln which has transformed cement-burning from a batch operation to a continuous operation. Civil engineering has been essential because if there were no construction activities there would be no demand for the product. Consequently no statement in this paper should be interpreted as claiming credit for chemistry at the expense of other branches of science.

The purpose is to point out that the processes of the industry are basically chemical and to discuss them in chemical language. The economical handling of raw materials, intermediate products, and finished cement on a large scale requires engineering skill of a high order. The result has been a focusing of attention on mechanical equipment and mechanical methods and a tendency to overlook the fact that it is chemical reactions that produce first cement and then hydrated cement, the latter being the final product sought. Stone and most other materials of construction differ from cement because in them chemical changes have reached completion, whereas cement itself may be considered an intermediate product requiring further chemical changes which take place after it is mixed with water. In the case of pre-cast concrete units, however, this difference does not hold.

Chemical Industry Defined

The term chemical industry is popularly employed in a too restricted sense. It is applied to the manufacture of chemicals, drugs, dyes, explosives and the like—which, of course, is correct as far as it goes, but scores of other industries such as cement, steel, paint, glass, etc., may just as correctly be classed as chemical industries, since they involve chemical changes and consequently the formation of chemical compounds. A chemical industry is any industry in which chemical changes take place in converting the raw materials into the finished product.

Popular Ignorance of Chemistry

It is probably not too much to say that of all the branches of science on which modern industry is based, chemistry is the least understood by the average person. The war did much to bring the science before the non-technical public; articles on explosives, poison gases, gas masks, helium, surgical dressings and the like were so numerous that people began to realize that chemistry exists. The popularization of the science was reflected by the number of advertisements of the day that mentioned chemical control, and the use of analysis in the selection of raw materials. But this has largely passed along with many other abnormalities of the war, and the public has forgotten most of what it learned about chemistry and returned to its normal state of ignorance about things chemical.

The reason for this is not difficult to find. The subject matter and the apparatus employed in the science possess little interest for the uninitiated. A crowd will gather around a steam shovel in operation or be interested in a new type of airplane, but to one who knows no chemistry, a string of chemical formulas or a piece of curiously formed glassware means nothing. For instance, in a paper† on the subject of soils, it is stated: "Some of the organic compounds isolated from soils and identified are as follows: Monohydroxystearic acid, dihydroxystearic acid, trimethylamine, trithiobenzaldehyde . . ." There are 35 compounds in the list. This is of great interest to a student of organic chemistry, but to others, it is only a series of meaningless, unpronounceable words.

When the average person visits a cement plant in operation he is impressed by the great engines in the power plant, the work of the crushers and grinders and the roar of the kiln, but he sees little or nothing of the chemical control and probably does not understand what he does see. And this state of affairs is not confined to outsiders. Many men in the industry take the chemical work for granted and think of it only in terms of a few analyses considered necessary now and then in connection with the operation of the plant. Many reactions take place during the manufacture and use of cement, which are just as typically chemical as any that take place in flask or beaker, and the materials involved are chemicals, though not in the confines of reagent bottles.

Cement Manufacture a Chemical Industry

The cement industry of today, which includes the manufacture of cement and the use of cement as a component of concrete, is a chemical industry. Three series of chemical reactions are fundamental:

1. Synthesis of a number of inorganic compounds collectively known as cement (conversion of raw mix into cement clinker).
2. Reactions between these compounds and water (hydration of cement after mixing with water).
3. Modification of reactions in Series 2, or modification of the products of these reactions, by foreign substances§ (the effect of foreign substances during, or subsequent to, hydration).

§In this paper, we shall consider cement as consisting of pure compounds of the elements, calcium, silicon, aluminium, and oxygen; water, as pure water, that is, not containing any substances in solution; and a foreign substance as any substance (other than water) in contact with cement either during, or subsequent to hydration.

The cement manufacturer is concerned with all three series of reactions, but his work lies principally with Series 1. He must select suitable raw materials, properly grind and proportion them, and then raise the resulting mixture to the proper temperature in the kiln. In selecting raw materials, their chemical composition, uniformity, physical properties, and accessibility all must be considered. The chemical composition must be such that a mixture of the materials may be prepared which will contain suitable relative amounts of calcium, silicon, and aluminum without objectionable amounts of any impurity. The object of grinding the materials is to increase the total surface of a unit mass of the materials, enabling particles of unlike composition to come into closer contact with each other and with the hot gases of the kiln.

When cement is used as a component of

*Reprinted from the "Chemical Age" of April, 1923.

†Reprinted from the "Chemical Age."

concrete, it is mixed with suitable inert materials (or aggregates) and water. The aggregates serve to *dilute* the cement and thereby enable less cement to be used for a given mass of concrete. The cement and water are the active components of concrete and the strength of concrete is dependent on the chemical reactions which take place. A number of factors are concerned in the production of strong, durable and economical concrete. The cement must be of good quality; the aggregates sound, well-graded, and not too great in quantity (in relation to the cement used); and the cement-water ratio must be kept within certain limits. Harmful impurities must be avoided whether in the cement, the water or the aggregates.

Since we are discussing the making of concrete from the chemical point of view, we are interested primarily in the reacting substances, cement and water, and in the reactions which take place. Definite proportioning and intimate mixing of the reacting substances, the effect of temperature, and velocity of the reactions all must be taken into account. It is evident that the complete hydration of a given portion of cement requires a definite amount of water. The use of less or more than this amount of water is objectionable. If less, the full value of the cement is not obtained; if more, the cementing value of some of the cement particles is lessened.

In mixing and pouring concrete, the water is of importance physically also—that is, sufficient water must be present to act as a lubricant and thus facilitate the pouring. If too much water is present, the strength is decreased, partly at least from physical causes. It has thus come about that although the strength of concrete is dependent on the hydration of cement, a chemical phenomenon, the quantity of water used is at present based largely on physical considerations.

Returning to chemical principles, the velocity of reaction is highly important. If hydration is too rapid, there is not sufficient time to place the concrete. Forms cannot be removed until the concrete has sufficiently hardened, consequently it is not desirable to have the hydration too slow. Freezing of the water in concrete virtually removes the water from the system, and consequently retards the reaction, and likewise is harmful in other ways.

Under the third series of reactions have been grouped the effects of foreign substances. These foreign substances include impurities in the cement, water, and aggregates from which concrete is made, and also foreign substances which may come into contact with the concrete after it is in place. Most foreign substances are unimportant, some are harmful and others are beneficial. In the cement itself too great a percentage of magnesia or sulphuric anhydride is harmful and is ruled out by standard specifications. However, a small amount of magnesia is harmless and a small amount of sulphuric anhydride is beneficial.

Gypsum is added to the clinker before grinding for the purpose of retarding the reactions between the cement and water, or for controlling the set. Small amounts of ferric oxide and alkalies in the raw materials are beneficial since they act as fluxes and allow reactions to take place in the kiln at lower temperatures.

As a result of numerous tests, we now know fairly well what impurities in water and aggregates should be avoided, but in many cases we do not know the chemistry involved. The same is true of foreign substances coming into contact with concrete in place. In this case, however, we know what subtsances are the most harmful and something about the mechanism of the reactions that take place between these substances and the cement.

OUTLINE OF THE MANUFACTURE AND USE OF CEMENT

A description of the process in ordinary language (first column) and a parallel description in chemical terminology.

MANUFACTURE

Selecting the Raw Materials

Suitable raw materials are selected.	Materials are selected which may be mixed to give correct proportions of Ca, Si, and Al.

Preparing the Raw Mix

The raw materials are crushed, ground, and proportioned.	The raw materials are mixed on the basis of their analysis and ground so that they may be brought into intimate contact with each other and with the hot gases of the kiln during the burning process.

Burning the Clinker

The raw mix is passed through a rotary kiln where it is subjected to a high temperature and converted into cement clinker.	When the raw mix is passed through the kiln, the heat produced by the combustion of the fuel (gas, oil, or pulverized coal) raises the temperature of the mix and results in a series of chemical reactions. Compounds known collectively as cement are synthetized.

Adding the Gypsum

Before the clinker is ground gypsum is added for the purpose of controlling the set.	In order to decrease the velocity of the reaction between cement and water, calcium sulphate is added to the clinker before grinding.

Grinding the Clinker

Clinker is converted into cement by grinding.	The clinker must be very finely divided before it can be used. Clinker itself is inactive because it does not offer a sufficiently large surface of contact.

TESTING THE PRODUCT

The finished cement must conform to the specification of the American Society for Testing Materials.

Chemical Properties

Upper limits: Loss on ignition 4 per cent; insoluble residue 0.85 per cent; sulphuric anhydride (SO_3) 2 per cent; magnesia (MgO) 5 per cent.	Loss on ignition is due to water and carbon dioxide. A high loss in ignition indicates the cement has not been properly stored, and that the cement contains just that much valueless material. The insoluble residue is inert material and may result either from excessive silicates in the raw mix or from insufficient burning in the kiln. Sulphuric anhydride and magnesia are harmful when present in excessive amounts.

Specific Gravity

The specific gravity of cement shall not be less than 3.10.	Materials likely to be used as adulterants have specific gravities less than 3.10.

Fineness

The residue on a standard No. 200 sieve shall not exceed 22 per cent by weight.	Fine grinding allows more intimate mixing of the two reacting substances, cement and water.

Time of Mixing

The cement shall not develop initial set in less than 45 min. when the Vicat needle is used or 60 min. when the Gillmore needle is used. Final set shall be attained within 10 hr.	The velocity of the reactions must not be too great to allow proper mixing and placing of the concrete. If the velocity is too low, forms must not be left in place for too long a time.

Tensile Strength

The average tensile strength in pounds per square inch of not less than three standard mortar briquets—shall be equal to or higher than 200 lb. in 7 days, and 300 lb. in 28 days.	The tensile strength developed by hydration of a small portion of the cement is measured.

PREPARING THE CONCRETE

Some of the factors on which good concrete depends are proportions of the cement, water and aggregates; duration and thoroughness of mixing; duration and method of curing; the temperature.

Proportions of Cement, Water and Aggregates

Sufficient cement must be used to develop the desired strength. There must be sufficient water to give a workable mix, but little in excess of this amount.	It is obvious that there should not be too great a proportion of the inert material. The reacting substances should be in equivalent proportions.

Duration and Thoroughness of Mixing

Mixing should be continued until the mixture is as nearly homogenous as possible.	The reacting substances should be thoroughly mixed, and this mixture should in turn be evenly distributed in contact with the inert material.

Duration and Method of Curing

Concrete should be allowed to stand for some time (protected from drying out) before a load is applied.	Reactions between the components of cement and water are slow (for several reasons). If the concrete is allowed to dry out, one of the active substances is partly removed before the reactions are complete.

Temperature

Other factors being the same, concrete hardens more rapidly at high temperatures.	Like many other chemical reactions, the velocity of hydration is affected by the temperature. High temperatures result in removal of some of the water by evaporation and low temperatures render the water inactive by freezing.

Cement Manufacture and Use Outlined

The above is an outline of the manufacture of cement and its use as a component of concrete. In the first column the customary language is used, while in the second column the process is treated in chemical terminology:

The relation of chemistry to the cement industry could be discussed indefinitely by

considering the chemical industries that provide necessary equipment and supplies. Any modern manufacturing process may be considered a part of technology as a whole.

A cement plant is dependent on other industries for equipment and supplies of all kinds and in the production of many of these chemistry is essential. Just to mention a few, there are iron and steel of various grades, refractories, lubricants, belts and bearing alloys. The cement industry reciprocates by furnishing these industries with buildings, floors, loading platforms, machinery foundations, tanks, and bins.

Oil Shale Developments Abroad

AN English company has secured a lease on the oil shale mines at Vanamoisa, Esthonia, formerly held by the state, and is erecting a retorting plant, built by Vickers Ltd., to have an initial throughput of 50 tons a day. About two months will be needed in which to put the plant in operation.

The Fusion retort of England has been selected for use on the Esthonia shale. This retort is of the horizontal, rotary type, externally heated by gas. Within the retort is a free moving tumbler, or breaker, which, as the retort revolves, is carried up on one side and then falls over and thus breaks up the shale during the process of distillation. This breaker device seems to make caking, gumming, and sticking impossible.

The high price of crude oil in Australia has brought about renewed interest in securing oil from shale. The Prime Minister has been appealed to for government aid in exploring the deposits and subsidizing an operating company. Statements made show that in certain areas a yield of 2500 tons of shale to the acre can be expected and that a retorting plant of 300 tons throughput a day can supply 30,000 gallons of oil a day for 100 years. The delay in developing the oil shale industry in Australia has been the lack of high grade technical men to direct the work, no thorough investigation and test of the deposits themselves, and no retort adapted to the oil shale itself.

The large deposits of torbanite—the original source of oil in England and Scotland—in the Ermeeo district of South Africa, are receiving marked attention. E. H. Cunningham-Craig, the noted English expert, is preparing a report which will show the extent and value of these deposits. Ronald Johnstone of London—the expert oil shale engineer—is preparing plans and estimates of cost for a commercial plant. Practical tests indicate commercial success, chiefly because torbanite is the richest raw material from which oil can be derived. A test plant of the Lamplough-Harper type has been used on the torbanite with satisfactory results. From a ton of torbanite 150 gallons of crude oil were obtained.

American Lime and Stone Company's New Sales Manager

WHEN we asked "Charlie" Foote for his photograph, he said he didn't have one and suggested that if we run across a photo of someone with a bald head and wearing glasses, that it would answer the purpose. However, we took a firm stand and finally succeeded in getting from him the photograph appearing with this.

"Charlie" was born in Bridgeport, Conn., and descended from a long line of "Nut-Meggers" the first of whom came over and settled near Watertown, Mass. One, bolder than the rest, Nathaniel Foote by name,

"Charlie" Foote

struck out into the wilderness in 1635 and settled what is now Wethersfield, Conn.

His first position was with an importing and exporting house in New York City. A few years later he returned to Connecticut and entered the employ of Wilmot & Hobbs Mfg. Co., makers of hot and cold rolled strip steel.

He had the opportunity of working through practically all departments in the manufacturing end, and in addition, held several positions in the office. Later, he was returned to the New York office and held the positions of assistant sales manager, sales manager, and finally was made general sales manager with headquarters at the main office.

Mr. Foote served as general sales manager with a Western company, and after that became associated with a smaller mill in the East as vice-president in charge of sales. This position he held practically up to the time of coming to Bellefonte and joining the American company's forces.

Mr. Foote has already made numerous friends in the American company and is well liked. It is expected that this new Foote will keep the salesmen on their toes and help to keep the American company on its feet.—*Warner-American News.*

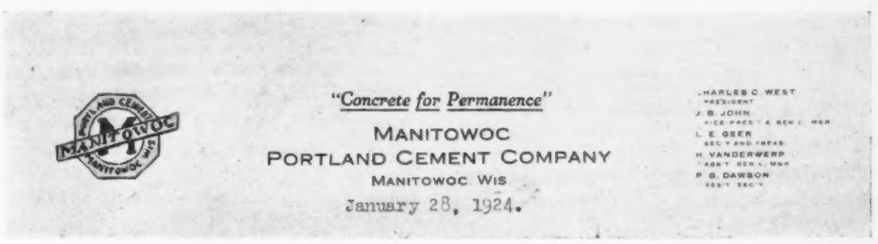
Immigration Legislation

IMMIGRATION is to be a subject of highest interest when Congress convenes. Legislation must be enacted to replace the present law, which dies next year.

Already many organizations are well advanced in the preparation of their arguments to be presented to the law makers in the interests of industrial labor and independent groups. The country is being combed for data for use in bolstering the views and opinions of the various groups that are vitally interested in the form of the next immigration law.

The construction industry, through the Associated General Contractors of America, is joining in this general move for the gathering of information. This industry, because of the increasing number of native born men who seek "white collar" jobs, is sadly in need of an adequate supply of labor. Under present conditions, which are rendered acute during periods of peak operation, contractors are forced to bid against each other for labor in many instances. Wages thus are forced to an unnatural level and unhealthy industrial conditions result. The increased costs are passed along and eventually prevent necessary building operations from being undertaken.

The construction industry is not asking that a mass of alien non-producers be permitted to enter the country. But it does feel that its interests are not at variance with those of the country at large when it expresses its desire for legislation that will permit real man-energy to be brought into an industry that essentially is a producer.—*A. G. C. Members News Letter.*



A new brand of cement which will be put on the market this spring

Traffic and Transportation

By EDWIN BROOKER, Consulting Transportation and Traffic Expert,
Munsey Building, Washington, D. C.

Single vs. Joint Line Hauls

Western Cement Case 48, *I.C.C.* 201,248—"No distinction in rates is made for hauls over more than one line. Such does not seem to have been the practice of the carriers in this territory with reference to cement."

52 *I.C.C.* 225,232—"Of the proposition set forth in the rules to show cause, there remains for consideration the matter of applying an arbitrary where a joint-line haul is involved. We do not feel that an arbitrary should be added."

87 *I.C.C.* 451,465—"Traffic from the Gas Belt mills to numerous points in Oklahoma moves through the same junctions in Kansas through which traffic destined to many Kansas points moves, and some of the junction points are but a short distance north of the Oklahoma border."

Sand and Gravel vs. Slag and Crushed Stone

74 *I.C.C.* 533,534—"Distance scale on slag applicable between stations on the Louisville and Nashville in Alabama was the lowest scale published, but it is also applicable on sand and gravel, stone, broken, crushed, rubble, and ballast.

85 *I.C.C.* 184,186—"Many of the rates shown apply on both sand and gravel, and defendants concede that, from a strictly transportation standpoint, like rates should be maintained for corresponding hauls on these commodities.

"We find that the rates assailed on both sand and gravel in carloads, were, are, and for the future will be, unreasonable, to the extent that they exceeded $1 prior to July 1, 1922, and 90 cents on and after that date for the future." Applies from Montgomery, Ala., to Lagrange, Pa., a distance of 104 miles.

Page 3081 of Record of Docket Ex Parte 74, dated June 19, 1920—Chairman: . . . Mr. Thom, before the hearing closes, I wish you would have the carriers give us their reasons for lower rates on crushed slag than on sand and gravel.

Mr. Thom: Yes.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to week beginning March 3:

Central Freight Association

8001. Crushed stone and crushed stone screenings. Thornton, Ill., to Huntingburg, Boonville, French Lick and Rockport, Ind. Present, combination rates on Princeton, Ind.; Proposed, $1.40 per net ton.

8003. Sand and gravel. Ft. Jefferson, Ill., to Laura and Ludlow Falls, Ohio. Present, 70 cents per net ton; proposed, 60 cents per net ton.

8013. Sand, gravel and crushed stone. Ohio and Indiana to Chicago division (East) and Michigan division of C. C. C. & St. L. Ry. per net ton as follows:

From Greencastle, Ind. to stations Brookfield to Greensburg, inclusive, 88 cents to $1.

From Greencastle, Ind. to stations on the C. H. & G. branch, Greensburg, to Columbus, Ind., inclusive, $1 to $1.01.

From Greencastle, Ind. to stations on the F. F. & M. branch, Fairland to Martinsville, Ind., inclusive, 88 cents to $1.

From Greencastle, Ind. to stations on the Michigan Division, Grensburg, Ind., to Jeffersonville, Ind., inclusive, $1 to $1.17.

From Ingalls, Ind. to stations Gallaudet to Shelbyville, inclusive, 88 cents.

From Ingalls, Ind. to stations on the C. H. & G. Branch, Ewington, Ind. to Columbus, Ind. inclusive, $1.01.

From Ingalls, Ind. to stations on the F. F. & M. Branch, Fairland, Ind., 88 cents Mahalasville to Martinsville, Ind., inclusive, $1.

From Ingalls, Ind., to stations on the Michigan Division, Brewersville, Ind. to Jeffersonville, Ind., inclusive, $1.05 to $1.17.

From Indianapolis, Ind. to stations Brookfield to Adams, Ind., inclusive, 69 cents to 82 cents.

From Indianapolis, Ind. to stations on the C. H. & G. Branch, Ewington to Columbus, Ind., inclusive, 95 cents to $1.01.

From Indianapolis, Ind. to stations on the F. F. & M. Branch, Fairland to Martinsville, inclusive, 69 cents to $1.16.

From Anderson, Ind. to stations Gallaudet to Greensburg, Ind., inclusive, 88 cents to 82 cents.

From Anderson, Ind. to stations on the C. H. & G. Branch, Greensburg, Ind. to Columbus, Ind., inclusive, 82 cents to $1.01.

From Anderson, Ind. to stations on the F. F. & M. Branch, Fairland to Taggart, Ind., inclusive, 88 cents to $1.

From Anderson, Ind. to stations on the Michigan Division, Greensburg, Ind. 82 cents.

From Columbus, Ind. to stations Indianapolis to Adams, Ind., inclusive, 88 cents to 82 cents.

From Columbus, Ind. to stations on the C. H. & G. Branch, Ewington, Ind., 75 cents; stations Hope to Lambert, Ind., inclusive 69 cents.

From Columbus, Ind., to stations on the F. F. & M. Branch, Fairland to Urmeyville, Ind., inclusive 88 cents; stations Branch to Martinsville, inclusive, $1.

From Columbus, Ind., to stations on the Michigan Division, Horace to Jeffersonville, Ind., inclusive, 82 cents to $1.15.

8014. Sand, gravel and crushed stone. Indiana and Ohio to Indianapolis division of C. C. C. & St. L. Ry. per net ton, as follows:

From Indianapolis, Ind. to stations Chesterfield to Union City, Ind. inclusive 85 cents to 88 cents.

From Pendleton, Ind. to stations Indianapolis to Ingalls, Ind. inclusive, 85 cents to 69 cents; stations Anderson to Union City, Ind., 69 cents to 88 cents.

From Anderson, Ind. to stations Brightwood, Ind., and Lawrence, Ind., 85 cents; to stations Oaklandon, Ind., and McCords, Ind., 70 cents; to stations Selma to Farmland, Ind., inclusive, 76 cents; to station Harrisville, Ind., 88 cents.

From Ingalls, Ind., to stations Yorktown, Ind., to Union City, Ind., inclusive, 70 cents to 88 cents.

From Germantown, Ohio to station Fortville, Ind., $1.13; from stations Anderson, Ind., to Harrisville, Ind., inclusive, $1.01.

From Ft. Jefferson, Ohio, to stations Brightwood, Ind., to Chesterfield, Ind., inclusive, 98 cents to 88 cents.

From Lewisburg, Ind., to station Union City, Ind., 76 cents.

From Bluffton, Ind., N. Y. C. & St. L. to stations Brightwood, Ind., to Pendleton, Ind., 98 cents.

8015. Sand, gravel and crushed stone. Indiana and Ohio to Springfield division of C. C. C. & St. L. Ry. per net ton, as follows:

From Indianapolis, Ind. to stations Mohawk to Crete, Ind., inclusive, 81 cents to $1.01.

From Ingalls, Ind. to station Shirley, Ind., 75 cents; to stations Lynn, Ind., and Crete, Ind., 88 cents.

From Pendleton, Ind., to stations Indianapolis, Ind., to Crete, Ind., inclusive, 85 cents to 88 cents.

From Anderson, Ind. to stations Hunter, Ind., to Wilkinson, Ind., inclusive, 92 cents to 81 cents; from stations Messick, Ind. to Crete, Ind., inclusive, 88 cents.

From St. Paul, Ind. to stations Shirley to New Castle, Ind., inclusive, 88 cents.

From Germantown, Ohio to stations New Castle, to Carlos City, Ind., inclusive $1.01.

From Jefferson, Ohio, to station Maxwell, Ind., $1.01; to station Shirley, Ind., $1.01.

8038. Crude slag. (a) Sharpsville, Pa., (b) Sharon, Pa., to (a) Hubbard, Ohio, (b) Sharpsville, Pa. Present, 45 cents per net ton., proposed, 40 cents per net ton.

8042. Sand and gravel. Wolcottville, Ind., to Indiana and Ohio.

To	In cents per net ton Present	Proposed
St. Joe, Ind.	97	88
Hicksville, Ind.	97	88
Sherwood, Ohio	100	88
Defiance, Ohio	100	88

8048. Crushed stone. Marblehead, Ohio to Ohio. Present, no commodity rates in effect; proposed, to Carey, 90, Upper Sandusky, Ohio, 90, Lima, Ohio, 100, Delphos, Ohio, 100, Columbus, Ohio, 100, Cincinnati, Ohio, 140; rates in cents per 100 lb.

8049. Sand and gravel. Kenneth, Ind. to Miami, Ind., present, 92 cents per net ton; proposed, 81 cents per net ton.

8050. Sand and gravel. Kenneth and Lake Ciecott to Clarks Hill, Ind. Present, sixth class rates; proposed, 90 cents per net ton.

8052. Sand and gravel. Winona Lake, Ind. to Indiana.

To	In cents per net ton Present	Proposed
South Bend	95	84
Lakeville	95	76
Butler	88	80
La Otto	85	80
Denver	88	80

8066. Slag. Chicago district to Indiana, Ohio and Michigan. (Rates in cents per ton of 2000 lb.):

To	Present	Proposed
Willow Creek, Ind.	101	92
Crocker, Ind.	101	92
Westville, Ind.	101	95
Magee, Ind.	101	95
Kingsbury, Ind.	101	100
Dillon, Ind.	101	100
North Liberty, Ind.	101	100
Pine, Ind.	101	101
Lakeville, Ind.	126	115
Wyatt, Ind.	139	127
Wakarusa, Ind.	164	138
New Paris, Ind.	164	138
Benton, Ind.	164	138
Millersburg, Ind.	164	138
Topeka, Ind.	164	138
Eddy, Ind.	164	138
Wolcottville, Ind.	164	138
South Milford, Ind.	164	138
Helmer, Ind.	164	138
Ashely-Hudson, Ind.	164	138
Steubenville, Ind.	164	138
Hamilton, Ind.	164	138
Edon, Ohio	164	140
Montpelier, Ohio	164	140
West Unity, Ohio	189	161
Wauseon, Ohio	252	207
Alvordton, Ohio	189	161
Adrian, Mich.	252	207
Raisin Center, Mich.	252	207
Britton, Mich.	252	207
Milan, Mich.	252	207
Romulus, Mich.	290	230
Detroit, Mich.	290	230
Toledo, Ohio,	290	230

Illinois Freight Association

2339. Crushed stone. Carloads, minimum weight capacity of car; $1.40 per net ton from Lehigh, Kankakee and Thornton, Ill., to Shawneetown, Ill.

2364. Sand and gravel. Carloads, minimum weight marked capacity of car, 76 cents per net ton from Pekin, Ill., to Natrona and Mason City, Ill.; rate proposed not to include connecting line switching charge at Pekin, Ill., except in case an intermediate belt line is used when switching of

such intermediate belt line not exceeding $2.70 per car will be absorbed.

Southern Freight Association

12732. Sand. Car load from Estill Springs, Tenn. to Rockwood, Tenn. Present, $1.95 on commercial and $1.80 per ton on municipal (Nashville, Tenn., combination); proposed $1.53 per net ton, based on the Georgia proposed joint line scale, less 10% for the distance.

12761. Cement. Car load from Nashville, Tenn. to Columbia, Tenn. Present, 6½ cents per 100 lb.; proposed, 8 cents per 100 lb. The proposed revision is for the purpose of correcting error made in tariff publication.

12844. Gravel. Car load from Nortonville, Millport and Providence, Ky. to Nebo and Manitou, Ky. Class N rates now apply. Proposed to Nebo, from Nortonville and Millport, 90 cents, from Providence, 70 cents; to Manitou, from Nortonville and Millport, 80 cents; from Providence, 70 cents per net ton. The proposed rates are made in line, distances considered, with rates from and to other points in the L. & N. R. R.

12852. Gravel. Car load minimum weight 40,000 lb., between points in the Birmingham Ala., district, as shown on page 14 of So. Ry. I. C. C. A9761. Present, 3½ cents per 100 lb.; proposed, 2½ cents per 100 lb. (Applicable from points in the Birmingham district [when from beyond] to points in the Birmingham district.) The proposed rate is the same as applicable on sand, slag, etc.

12854. Sand, furnace or foundry. Car load from Chester, Va., to Lynchburg, Va. Present, $1.72 per net ton. (Petersburg, Va. combination); proposed, $1.39 per net ton. (Applicable only on interstate traffic.)

12878. Cement. Car load from Eastern port cities and points made with relation thereto and from specific interior Eastern points to Spocari, Ala., applicable via rail and water route through Mobile, Ala., (sixth class rates now apply). Proposed rates same as in effect to Demopolis, Ala.

Southwestern Freight Bureau

190. Lime, common. To establish rates on common lime. Carloads, minimum weight, 30,000 lb., from Dittlinger, Austin, and McNeill, Tex., to points in Louisiana, that will be on a proper relation to rates in effect on similar traffic from Arkansas and Alabama producing points. Claim is made that under present rates the points named are unable to compete with producing points in Arkansas and Alabama.

255. Lime. To amend Item 7828A, S. W. L. Trf. 1-0, applying on lime, carload minimum weight 30,000 lb., from Missouri points to Ft. Worth, Dallas, and Lovefield, Tex,, by adding the Missouri-Illinois, R. R. under Note A. therein. Such adjustment is claimed necessary to place rates from points on this line on a parity with rates in effect via other lines from points in this territory.

Transcontinental Freight Bureau

4547. Crushed stone, C. L., W. B. Proposed to amend item 4080, Trf. 4T (I. C. C. 24, A114, 1471, 1130, N. W. Hawkes, H. Wilson, B. T. Jones and R. H. Countiss, agents, respectively) by publishing through rate of 94 cents per 100 lb., minimum weight, 80,000 lb. from Crown Point, N. Y. to British Columbia Terminals, same as the available combination through Chicago, Ill.

Western Trunk Line Docket

3691. Stone, all kinds or granite. Carload between Twin Cities, and Chicago and St. Louis groups. Present, stone, natural, blocks, pieces or slabs, N. O. I. B. N. granite, jasper, marble or onyx, Class C, per item 10, page 387. Consolidated Classification No. 3, Chicago and Peoria 26 cents and St. Louis 27½ cents per 100 lb., proposed, stone, all kinds, or granite, polished, 2.5 cents per 100 lb. higher than rate on stone, all kinds or granite, not polished, as provided in Items 1430 and 1440 of W. T. L. 5K, resulting in rates as follows: Chicago, 17 cents, Peoria 17 cents, St. Louis, 18 cents. Present, minimum 36,000 lb.; Proposed, 90 per cent of the marked capacity of car, but not less than 40,000 lb.

Book Reviews

Steam Shovel Mining

STEAM SHOVEL MINING. By Robert Marsh, Jr. Cloth, 258 pp. and well illustrated. McGraw-Hill Book Co., 239 West 39th street, New York.

IT IS to be hoped that no reader will be prejudiced against Mr. Marsh's book by the word "mining" in the title, for the kind of mining he refers to is only the regular quarry operation, employing well-drill blast holes, "dinkies" and dump cars and steam shovels for loading, with which we are all familiar. Much of Mr. Marsh's experience has evidently been in the big steam shovel copper mines. But these are only quarries, and the single reason for calling them mines is that they produce metallic ore. So there is hardly a line in the book but what will interest the quarry operator.

The book is not so much a book about steam shovels as it is about their use and application, and this is wherein its value lies. One can get the needed information of construction and repair parts from the builders, but information as to the systematic and intelligent use of the steam shovel, based on actual field experience, is hard to get.

Perhaps the most important chapters are those that begin with the method of attack and discuss such matters as the height of banks, width of benches, slides, casting over, thorough cut, etc. The matter of laying out the pit is well explained and illustrated with diagrams.

Drilling and blasting are very well handled, tripod drilling, well drilling and the gopher or coyote hole system are all well explained with numerous sections and diagrams. There are numbers of examples of the efficiency of large shots in mines and quarries and useful tables of powder charges for depths of hole, etc.

Under the heading, "Determination of a Power Shovel Mine," the whole subject is gone into in a large way, from the preliminary mapping to the finished work. Problems are stated and their solution given along with the necessary engineering calculation. Comparison is made with other methods of excavating and removing ground. Costs from various sources are discussed and examples given, with a special chapter on "Administration."

"Disposal of Material" is a chapter that is full of meat for the operating man, as it discusses both equipment and methods. Dumps and trestles are well handled.

Although the book treats primarily of steam shovels, electric and gas power shovels are not neglected. Most of the subject matter of the book will apply to shovels of any power.

The book is one that ROCK PRODUCTS can thoroughly recommend to those of its readers who operate steam shovels and gravel pits, and it will be found as interesting to the man on the job as it is to the executive or the engineer.

Mills' Materials of Construction in the Second Edition

MATERIALS OF CONSTRUCTION, THEIR MANUFACTURE AND PROPERTIES. By the late Prof. Adelbert P. Mills, of Cornell University. Second edition, edited by Harrison W. Hayward, professor of materials of engineering, Massachusetts Institute of Technology. Cloth, about 500 pp.; illustrated with many drawings and diagrams. John Wiley & Sons, Inc., New York. Price $4.

"MILLS' Materials of Construction" has been known as a standard work on the subject since 1915, when the first edition was issued. In the second edition several chapters have been condensed, parts of others have been rewritten and new chapters have been added. The book has been divided into sections and each section separately paged, an improvement which is of doubtful value.

Of course the entire book is of value to the rock products industry, as this industry does a great deal of building. But the sections in the first half of the book have an especial interest since they deal in the products themselves; that is, such materials as gypsum, lime, cement, crushed rock and sand and gravel.

Naturally, such a book cannot go too deeply into the technique of the production of these substances but there is enough given so that the engineer who wishes to use such material in designing can find all that he needs to know. And, what is more important from the standpoint of the designer, is that the physical characteristics of these materials are well discussed. There are excellent tables and curves to show the tensile and compressive strengths of the different substances and their combination in mortars, plasters and concrete, all of which are from reliable sources.

The chapters on plasters and the design of concrete mixes are especially good. The theory of mixing concrete is well handled. And, although the discussion is brief, the reader who studies it will have a very good idea of the relation of the characteristics of the aggregate to the strength of the concrete. The book does not commit itself as to any one of the three theories of concrete mixing, but it does give a clear explanation of all three. Every producer of concrete aggregate who is not familiar with the matter would do well to read these chapters.

Most designers of structures depend largely upon the standard hand books for information as to materials. This book goes a lot farther than any hand book could do and the arrangement is better. And the second edition is so much more complete and has so much more and newer matter than the first that the owners of first editions would be justified in buying the second.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.40	1.40	1.40	1.30	.....
Buffalo, N. Y.			1.50 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Prospect, N. Y.	.80	1.40	1.40	1.30	1.30	.....
Watertown, N. Y.	.50	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.75	.....	1.75	1.50	.....	.....
Buffalo, Iowa	1.00	.....	1.45	1.25	1.30	1.30
Dundas, Ont.	.75	1.10	1.10	1.10	.95	.95
Gary, Ill.	1.10	1.40	1.10	1.10	1.10	1.10
Greencastle, Ind.	1.25	1.15	1.05	1.05	1.00	1.00
Lannon, Wis.	.70	1.00	1.00	1.00	.90	.90
St. Vincent de Paul, P. Q.	.85	1.20@1.45	1.15	1.05	.95	.95
Sheboygan, Wis.	.90	.....	1.10	1.00	.....	.....
Stone City, Iowa	.75	.....	1.50†	1.40	1.30	.....
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada	1.90‡	2.25‡	2.25‡	2.25‡	2.00‡	2.00‡
Waukesha, Wis.	1.15	1.15	1.15	1.15	1.15	1.15
SOUTHERN:						
Alderson, W. Va.	.60	1.75	1.75	1.50	1.40	.....
Bridgeport and Chico, Texas	1.00	1.35	1.35	1.35	1.25	1.20
Cartersville, Ga.	1.75	1.50	1.50	1.15	1.15	1.10
El Paso, Texas	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.60	1.70	1.70	1.60	1.50	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Graysville, Ga.	1.00@1.25	.80@1.00	.....	.75@1.00	.75@1.00	.....
Rock Crusher, Ky.	1.50	1.25	1.25	1.25	1.25	1.15
WESTERN:						
Blue Spr'gs and Wymore, Neb.	.20	1.45	1.45	1.35@1.40	1.25@1.30	1.20
Cape Girardeau, Mo.	1.35	.....	1.25	1.25	1.00	.....
Kansas City, Mo.	1.00	1.65	1.65	1.65	1.65	1.65

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.60	1.35	1.15	1.00	.....
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.40@1.50	1.35@1.40	1.35@1.40
El Cerrito, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
E. Summit, N. J.	2.00	.....	.....	1.80	.....	.....
Eastern Massachusetts	.85	1.75	1.75	1.40	1.40	1.40
Eastern New York	.75	1.50	1.50	1.30	1.40	1.30
Eastern Pennsylvania	1.25	1.55	1.50	1.40	1.40	1.40
Meriden, Middlefield, New Britain, Rocky Hill, Conn.	.60	1.60@1.75	1.35@1.50	1.15@1.25	1.00@1.10	1.00@1.10
Oakland, Calif.	1.00	1.00	1.00	.90	.90	.....
Richmond, Calif.	.50*	.....	1.65*	1.50*	1.50*	.....
San Diego, Calif.	.50@.75	1.80@1.90	1.60@1.80	1.35@1.55	1.35@1.55	1.25@1.45
Springfield, N. J.	2.00	2.50	.....	1.80	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	.....
Columbia, S. C.	.50	.....	2.00	.....	1.60	.....
Eastern Penna.—Sandstone	1.25	1.55	1.45	1.25	1.25	1,25
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.	.75	2.00	2.00	1.35	1.35	1.25
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@2.00
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yd. †1 in. and less. ‡Prices include 90c freight.

Agricultural Limestone

(Pulverized)

Cassadaga, N. Y.—Marl, 50 lb. hemp bags ..... 7.00@ 9.00

Chaumont, N. Y.—Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$—Thru 100 mesh; sacks, 4.50; bulk **3.00**

Branchton, Pa.—100% thru 20 mesh; 80% thru 50 mesh; 60% thru 100 mesh (Four Leaf Clover Brand); sacks, 5.00; bulk 3.50

Hillsville, Pa.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; 94% thru 50 mesh; sacks, 5.00; bulk **3.50**

Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk 2.50

Watertown, N. Y.—Analysis 96-99% $CaCo_3$; 0.02% $MgCo_3$—90% thru 100 mesh, bags, 4.50; bulk 3.00

New Castle, Pa.—94% $CaCO_3$, 1.40% $MgCO_3$—75% thru 100 mesh, 94% thru 50 mesh; sacks, 5.00; bulk **3.50**

West Stockbridge, Rockdale, Mass., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk **3.25**

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 100 mesh.. 6.00

Belleville, Ont.—Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk **2.50**

Cypress, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$; 50% thru 100 mesh, 90% thru 50 mesh, 50% thru 50 mesh, 90% thru 4 mesh..... 1.50

Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 80-lb p. sacks 5.00; bulk **3.50**

Piqua, Ohio—Total neutralizing power 95.3%; 100% thru 10, 60% thru 50; 50% thru 100..... 2.10@ 2.25

100% thru 10, 90% thru 50, 80% thru 100; bags, 5.00; bulk..... **3.50**

100% thru 100, 85% thru 200; bags, 7.00; bulk..... **5.50**

Waukesha, Wis.—Analysis, neutralizing equivalent 107.38% $CaCO_3$; 99% thru 10 mesh, 55% thru 60 mesh; bulk **2.35**

200-mesh bags ex., returnable..... **4.50**

Hot Springs, N. C.—50% thru 100 mesh; sacks, 4.25; bulk..... **2.70**

Knoxville, Tenn.—80% thru 100 mesh, bags, 3.95; bulk..... **2.70**

Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200 lb. burlap bag, 4.00; bulk **2.75**

Mountville, Va.—Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks **5.00**

Colton Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk **4.00**

Lemon Cove, Calif.—Analysis, 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk..... **4.50**

Dundas, Ont.—Analysis, 53.80% $CaCO_3$, 43.31% $MgCO_3$—35% thru 100 mesh; 50% thru 50 mesh; 100% thru 10 mesh; bagged, 4.75; bulk.... **3.00**

Agricultural Limestone

(Crushed)

Bellevue, Ohio—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh..... **1.25**

Bettendorf, Iowa, and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh..... **1.50**

Buffalo, Iowa—90% thru 4 mesh..... **1.00**

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh **1.50**

Cartersville, Ga.—Analysis, 60% $CaCO_3$; 36% $MgCO_3$—all passing thru 10 mesh..... 1.50@ 1.75

Carthage, Mo.—Analysis, 98½% $CaCO_3$; 100% thru 10 mesh, 30% thru 100 mesh 1.75

Elmhurst, Ill.—Analysis, 55.73% $CaCO_3$, 20.69% $MgCO_3$; 50% thru 50 mesh **1.25**

Gary, Ill.—Analysis, 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 100 mesh.... 1.10

Huntington and Bluffton, Ind.—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh..... **1.25**

(Continued on next page)

Agricultural Limestone

(Continued from preceding page)

Greencastle, Indiana.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	**2.00**
Kansas City, Mo.—50% thru 100 mesh	**1.25**
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh	**1.20**
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 100% thru 4 mesh; 83% thru 10 mesh; bulk	1.25
Milltown, Ind. — Analysis, 91.95% $CaCO_3$, 4.87% $MgCO_3$; 36% thru 100 mesh, 43.2% thru 50 mesh	1.45@ 1.60
Monroe, Mich.—Analysis, 51.91% $CaCO_3$, 44.17% $MgCO_3$; agricultural limestone meal, 3/16 in. to dust, 30% thru 100 mesh	1.60
Ohio (different points), 20% thru 100 mesh; bulk	**1.25@ 1.50**
Piqua, Ohio—100% thru 4 mesh	1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	**.80@ 1.40**
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ¼-in. mesh	**1.30**
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	**.75**
Waukesha, Wis.—No. 1 kiln dried	**2.00**
No. 2 Natural	**1.75**
Alderson, W. Va. — Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh	**3.00**
50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	**2.75**
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 100 mesh	**1.50**
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCO_3$; 100% thru 4 mesh	**.50**
Kansas City, Mo., Corrigan Siding—50% thru 100 mesh; bulk	**1.60**
Tulsa, Okla.—90% thru 4 mesh	**.50**

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:	
Berkeley Springs, W. Va.	2.25@ 2.50
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.—24 mesh, 5.00; 40 mesh, 6.00; 100 mesh	7.00
Columbus, Ohio	1.50@ 1.75
Hancock, Md.—Damp, 1.50; dry	2.00
Mapleton, Pa.	2.25@ 2.50
Mapleton Depot, Pa.	2.00@ 2.25
Massillon, Ohio	3.00
Michigan City, Ind.	.50
Millville, N. J.	2.00
Mineral Ridge, Ohio	2.50
Ottawa, Ill.	1.25@ 1.50
Pacific, Mo.	2.25@ 3.00
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Ridgway, Pa.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.25
Sands, Pa.	2.50
San Francisco, Calif.	3.00@ 3.50
St. Louis, Mo.	2.25@ 3.00
Thayers, Pa.	2.50
Utica, Ill.	1.25@ 1.50
Zanesville, Ohio	2.50
Foundry Sand:	
Albany, N. Y. — Molding fine, brass molding	3.00
Molding coarse	2.75
Sand blast	4.50
Arenzville, Ill.—Molding fine	**1.50@ 1.75**
Brass molding	1.75
Beach City, Ohio.—Core, washed and screened	**2.00@ 2.50**
Furnace lining	**2.50@ 3.00**
Molding fine and coarse	**2.25@ 2.50**
Cheshire, Mass.—Furnace lining, molding fine and coarse	**5.00**
Sand blast	**5.00@ 8.00**
Stone sawing	**6.00**
Cleveland, Ohio—Molding coarse	1.50@ 2.00
Brass molding	1.50@ 2.00
Molding fine	1.50@ 2.25
Core	1.25@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f. o. b. producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Ambridge and So. Hts., Pa.	1.25	1.25	1.15	.85	.85	.85
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		1.00		1.25		1.75
Farmingdale, N. J.	.68	.68	.75		1.30	
Pittsburgh, Pa.	1.25	1.25	1.00	1.00	.85	.85
Portland, Me.		.50	1.75		1.35	1.25
Washington, D. C.—Rewashed, river	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Columbus, Ohio	.75	.75@1.10	.75	.75@1.00	.75@1.00	.75
Covington, Ind.	.75	.75	.75	.75	.75	.75
Des Moines, Iowa	.50	.50	1.25	1.60	1.60	1.60
			Unwashed ballast, .50 ton			
Attica, Ind.	.75	.75	.75	.75	.75	.75
Eau Claire, Wis.		.53d				.93@ .98d
Elkhart Lake, Wis.	.60	.60	.70	.70	.70	.70
Grand Rapids, Mich.		.50		.80		.70
Hamilton, Ohio		1.00			1.00	
Hersey, Mich.		.50				.75
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	1.00	.45@ .55	1.45@1.55	1.45@1.55	1.45@1.55	1.45@1.55
Mankato, Minn.	.40a	.40	.50†			
Milwaukee, Wis.	1.11	1.11	1.36	1.36	1.36	1.36
Moline, Ill.	.60	.60	Concrete gravel, 40% G., 60% S., .90			
Palestine, Ill.	.75	.75	.75	.75	.75	.75
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65§	1.45		1.45‖
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
Summit Grove, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.75	.90	.90	.75	.75
Waukesha, Wis.	.50	.50	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.75	1.50	1.40	1.40
			(.05 ton discount 10 days)			
SOUTHERN:						
Brookhaven, Miss.; Roseland, La.	.50			1.00		
Charleston, W. Va.	all sand 1.40 f.o.b. cars		all gravel 1.50 f.o.b. cars			
New Martinsville, W. Va.	1.00	1.00		1.20		.80
WESTERN:						
Baldwin Park, Calif.		.25@ .40	.50@ .80	.50@ .80	.50@ .80	
Crushed Rock			.90@1.10	.65@1.00e	.60@ .90	
Kansas City, Mo.	Kaw river sand .75 per ton f.o.b. plants					
Los Angeles, Calif.	.30	.70	1.35	1.25	1.15	
Pueblo, Colo.	1.10*	.90*		1.60*	1.60*	
San Diego, Calif.	.50@.65	.80@.90	1.40@1.50	1.20@1.30	1.00@1.10	1.00@1.10
Seattle, Wash. (bunkers)	1.50*	1.50*	1.50*		1.50*	1.50*
Webb City, Mo.	.75	.75	.25@ .75b		1.25c	1.15c

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Brookhaven, Miss., Rosel'd, La.	.75	.50			1.25	
Dudley, Ky.‡	1.05	1.05		1.00		
Elkhart Lake, Wis.	.60	.50				
Fishers, N. Y.	.60		.60			.50
Gainesville, Texas		.95				.55
Grand Rapids, Mich.				.55		
Hamilton, Ohio					.70	
Hersey, Mich.				.55		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas	1.10					.55
Mankato, Minn.			Pit run gravel, .50			
Moline, Ill.	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
St. Louis, Mo.						1.55
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waukesha, Wis.	.60	.60	.60	.60	.60	.60
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Pa.		.95@1.20	(crushed rock)			
Zanesville, Ohio		.60	.60			

*Cubic yd.; †pit run; §⅝ in. and less; ‡crushed rock; ‖2½ in. and less; (a) ¾ in. and less; (b) flint chats; (c) crushed flint; (d) from stock pile; (e) ¾ in. and less.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, O.	2.05	1.45	1.45	1.45	1.45	1.45	1.45
Jackson, O.		1.35		1.35	1.35	1.35	1.35
Toledo, O.	1.50	1.35	1.50	1.35	1.35	1.35	1.35
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.35	1.25	1.25	1.25	1.25
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ashland, Ky.		1.55	1.55	1.55	1.55	1.55	1.55
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50*	10.50*	10.50*	9.00		8.50	1.80
Buffalo, N. Y.				12.00				
Berkeley, R. I.			12.00					2.30
Lime Ridge, Pa.							5.00a	
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00				6.00	
York, Pa. (dealers' prices)		10.50	10.50	11.50			8.50	1.65b
CENTRAL:								
Cold Springs, Ohio	12.50	11.00	10.00		9.00	11.00‖	10.00	
Delaware, Ohio	12.50	10.00	9.00	11.00			9.00	1.60
Gibsonburg, Ohio	12.50				9.00	11.00	10.00	
Huntington, Ind.	12.50	11.00	10.00				10.00	1.60c
Luckey, Ohio	12.50‡	11.00	10.00‡					1.60
Marblehead, Ohio		11.00	10.00				10.00	1.60d
Marion, Ohio		11.00	10.00				10.00	1.80†
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.70c
Sheboygan, Wis.							9.50	10.25g
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50				9.00	11.00		
Woodville, O. (dlrs.' price)	12.50‡	10.00f	9.00‡	12.50	9.00	10.50	9.00f	1.60
SOUTHERN:								
Erin, Tenn.							8.00	1.25
El Paso, Texas							9.00	1.50
Karo, Va.							7.00	1.50
Ocala and Zuber, Fla.	13.00		9.00		11.00		10.00	1.70
Staunton, Va.					4.50		8.50	1.35
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							15.00	
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.50
Tehachapi, Calif.							13.00	2.10e

*Paper sacks; †180-lb. net, non-returnable metal barrel; ‡50-lb. paper bags, terms 30 days net, 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice; ‖ 80-lb. paper bags; (a) F. O. B. kilns; (b) 180 lb. net, 2.65, 250 lb. net; (c) wooden bbl.; (d) wooden, 1.60, steel, 1.80; (e) wooden bbl., steel bbl., 2.20; (f) F. O. B. Marion; (g) ton.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio—Core	.50@ 2.00
Furnace lining	2.00@ 2.50
Molding fine and coarse	1.50@ 2.50
Sand blast	3.50@ 5.50
Stone sawing	1.50@ 1.75
Traction	.50@ 1.50
Brass molding	2.00@ 3.00
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dunbar, Pa.—Traction (mill)	2.25
Dundee, Ohio.—Glass, core, sand blast traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core, roofing sand	1.25
Sand blast	3.25
Franklin, Pa.—Core	2.00
Furnace lining	2.50
Molding coarse	2.00
Brass molding	2.75
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled	.85
Bank run	.65
Kansas City, Mo.—Missouri river core	.80
Kasota, Minn.—Stone sawing (white glass sand)	1.50@ 2.00
Mapleton Depot, Pa.—Molding fine	2.00@ 2.50
Traction	2.00@ 2.25
Roofing sand	2.25
Massillon, Ohio—Molding fine, coarse, furnace lining and core	3.00
Traction	2.75
Michigan City, Ind.—Core	.50@ .55
Traction	.40
Millville, N. J. Core	2.00
Mineral Ridge, Ohio—Core	2.25
Furnace lining	1.75
Molding fine and coarse, roofing sand, sand blast, stone sawing	2.00
Traction	1.85
Montoursville, Pa.—Core	1.50
Traction	1.25
Brass molding	1.50@ 2.00
New Lexington, Ohio—Molding fine	2.75
Molding coarse	2.50
Ottawa, Ill.—Core, furnace lining, steel molding	1.50
Roofing sand	1.50@ 4.50
Sand blast	4.50
Ottawa, Minn.—Crude silica sand	.75@ 1.00
Pacific, Mo.—Core, furnace lining	1.00@ 1.25
Molding fine	.90@ 1.00
Stone sawing	1.00@ 1.75
Ridgway, Pa.—Core	2.00
Furnace lining, molding fine, molding coarse	1.25
Traction	2.25
Rockwood, Mich.—Roofing sand	3.00
Sand blast	3.75
Round Top, Md.—Roofing sand	2.25
Traction	1.75
Core	1.60

Miscellaneous Sands

(Continued)

San Francisco, Calif. (washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@ 3.50
(Direct from pit)	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Tamalco, Ill.—Molding coarse	1.40@ 1.60
Thayers, Pa.—Core	2.00
Furnace lining	1.25
Molding fine and coarse	1.50
Traction	2.25
Utica, Ill.—Core, molding fine and coarse, furnace lining	.65@ 1.40
Roofing sand, traction	1.25
Sand blast	2.50
Stone sawing	1.25@ 1.50
Brass molding	.75@ 1.25
Warwick, Ohio—Core, green, 2:00; dry	2.50
Molding fine, molding coarse, green, 2.00; dry	2.50
Traction	2.50
Zanesville, Ohio—Molding fine	1.75
Brass molding	1.75@ 2.00
Molding coarse	1.50
Furnace lining, molding steel	2.00
Traction	2.50

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Asheville, N. C.—Best white and 200-mesh (per ton)	8.00
Yellow (per ton)	9.00
Red (per ton)	13.00
Baltimore, Md.—Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel workers' crayons, per gross	1.25
Chatsworth, Ga.—Crude talc (grindings)	6.00
Ground (150-200 mesh), bulk	8.00@15.00
Chester, Vt.—Ground talc (150-200 mesh), bulk	8.00@ 9.00
Including bags	9.00@10.00
Emeryville, N. Y.—(325 mesh), bags	14.75
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (mine run) per 2000-lb. ton	2.75@ 3.50
Ground (150-200 mesh), bags	10.00@14.00
Keeler, Calif.—(150-200 mesh); carloads, 6000-lb. (bags extra)	18.00@30.00
Los Angeles, Calif.—Crude	15.00@22.00
Marshall, N. C.—Crude (gray)	4.50@ 5.00
Ground (60-80 mesh) (bags extra)	6.50@ 7.50
Ground talc (150-200 mesh); bags	8.00@12.00
Natural Bridge, N. Y.—Ground talc (300-325 mesh), 200 lb. bags	13.00@15.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
Ground talc (150-200 mesh), bulk	10.00@22.00
Vermont—Ground talc (20-50 mesh); bags	7.50@ 8.50
Ground talc (150-200 mesh); bags	10.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	7.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.50
(Bags extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.50

Rock Phosphate

(Raw Rock)

Per 2240-lb. Ton

Centerville, Tenn.—B.P.L. 65%, bags	8.50
Bulk	6.50
Gordonsburg, Tenn.—B.P.L. 68-72%	5.50@ 6.50
Tennessee—F. O. B. mines, gross ton, unground Tenn. brown rock, 72% min. B.P.L.	5.50
Paris, Idaho.—2000 lb. mine run, B.P.L. 75%	4.50@ 5.00
Ottawa, Minn.—All crude silica sand	.75@ 1.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Clay Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$10.00	$8.10	$7.80
24x14	10.20	10.00	8.10	7.80
22x12	10.80	10.00	8.40	8.75
22x11	10.80	10.50	8.40	8.75
20x12	12.60	10.50	8.70	8.75
20x10	12.60	11.00	8.70	8.75
18x10	12.60	11.00	8.70	8.75
18x 9	12.60	11.00	8.70	8.75
16x10	12.60	11.00	8.40	8.75
16x 9	12.60	11.00	8.40	8.75
16x 8	12.60	11.00	8.40	8.75
18x12	12.60	11.00	8.70	8.75
16x12	12.60	11.00	8.40	8.75
14x10	11.10	11.00	8.10	7.80
14x 8	11.10	10.50	8.10	7.80
14x 7 to 12x6	9.30	10.50	7.50	7.80
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

(Ground Rock)

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. ton	
Barton, Fla.—Analysis, 50-65% B.P.L.	3.50@ 8.00
Mt. Pleasant, Tenn.—B.P.L. 65%	6.50
Twomey, Tenn.—B.P.L. 65%	6.00@ 6.50

Florida Soft Phosphate

(Raw Land Pebble)

Per Ton

Florida—F. O. B. mines, gross ton, 68/66% B.P.L.	2.50
70% min. B.P.L.	2.75
72% min. B.P.L.	3.00
75/74%	4.00
77/76%	5.00
Jacksonville (Fla.) District	10.00@12.00

(Ground Land Pebble)

Per Ton

Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65% B.P.L.	5.75

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	22.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	23.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Barton, Wis., f.o.b. cars		10.50
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Slate granules	6.50@ 7.00	
Granville, N. Y.—Red slate granules		7.50
Harrisonburg, Va.—Blk. marble (crushed, in bags)	12.50@14.50	12.50@14.50
Ingomar, Ohio (in bags)		6.00@16.00
Mertztown, Pa. (granite) bags, $10.00; bulk		8.00
Milwaukee, Wis. (del.)		14.00@28.00
Newark, N. J.—Roofing granules		7.50
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsburg, N. J.—Evergreen, bulk	8.00@10.00	8.00@10.00
Creme and royal, bulk	15.00@20.00	15.00@20.00
Poultney, Vt.—Slate granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.—(2000 lb.)		@20.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b. cars, granite	4.50@ 6.00	4.50@ 6.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@35.00
Carpenterville, N. J.	19.00	31.50@45.00
Ensley, Ala. ("Slagtex")	16.00	26.00
Eugene, Ore.	25.00	35.00@70.00
Friesland, Wis.	21.00	32.00
Omaha, Neb.	18.00	30.00
Portland, Ore. (Del.)	21.00	45.00@55.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	35.00
Watertown, N. Y.	18.00@21.00	32.00@35.00
Wauwatosa, Wis.	15.00@16.00	28.00@75.00
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	15.00@16.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich.	11.00
Lancaster, N. Y.	13.00
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	14.00
Portage, Wis.	15.00
Rives Junction and Saginaw, Mich.	12.00
San Antonio, Tex.	12.50@14.00
Syracuse, N. Y. (delivered at job)	20.00
F.o.b. cars	15.00@16.00

Gray Klinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrated, per Ton Finishing	Common
Atlanta, Ga.	22.50	14.00
Baltimore, Md.	24.25	17.85
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	20.00
Dallas, Tex.	20.00	———
Denver, Colo.	24.00	———
Detroit, Mich.	20.00	19.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New York, N. Y.	18.20	13.10
St. Louis, Mo.	19.00	19.00
San Francisco, Calif.	22.00	———
Seattle, Wash. (paper sacks)	24.00	———

Portland Cement

Prices per bbl. and per bag net in carload lots.

	Per Bag	Per Bbl
Atlanta, Ga.	———	2.60
Boston, Mass.	———	2.43@2.63
Buffalo, N. Y.	———	2.38@2.48
Cedar Rapids, Iowa	.60	2.40
Cincinnati, Ohio	.59¼	2.37
Cleveland, Ohio	.59¾	2.41
Chicago, Ill.	.55	2.20
Columbus, Ohio	———	2.44
Dallas, Texas	.53¾	2.15
Davenport, Iowa	.57¼	2.29
Dayton, Ohio	———	2.44
Denver, Colo.	.63¾	2.55
Detroit, Mich.	.60	2.37
Duluth, Minn.	.54¼	2.25
Indianapolis, Ind.	.57¾	2.31
Kansas City, Mo.	.56¾	2.37
Los Angeles, Cal. (less 5c dis.)	.68	3.08
Memphis, Tenn.	———	2.60
Milwaukee, Wis.	.58¾	2.35
Minneapolis, Minn.	.60½	2.42
Montreal, Canada (sks. 20c ext.)	———	2.25
New Orleans, La.	———	2.90
New York, N. Y.	———	2.15
Philadelphia, Pa.	———	2.31
Phoenix, Ariz.	.82½	3.30
Pittsburgh, Pa.	.54¾	2.19
Portland, Ore.	———	3.05
San Francisco, Cal.	———	2.61
St. Louis, Mo.	.55	2.20
St. Paul, Minn.	.60½	2.42
Seattle, Wash. (10c bbl. dis.)	———	2.90
Toledo, Ohio	.60	2.33

NOTE—Add 40c per bbl. for bags.

Mill prices f. o. b. in Carload Lots to Contractors	Per Bag	Per Bbl.
Buffington, Ind.	.46¼	1.95
Concrete, Wash.	———	2.60
Dallas, Texas	———	2.05
El Paso, Tex.	.70	2.08*
Hannibal, Mo.	———	1.95
Hudson, N. Y.	———	2.00
Leeds, Ala.	———	1.95
Los Angeles, Calif.	———	2.65
Louisville, Ky.	———	2.35
Northampton, Pa.	———	1.95
Phoenix, Ariz.	———	4.30‡
Steelton, Minn.	.50	2.00
Universal, Pa.	.48¾	1.95

*Gross, 10c sacks and 10c per bbl. disc 10 days.
†Including cloth sacks.
‡Gross, 15c sacks and 5c per bbl. disc. 10 days

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White‡ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ½x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Black Hawk, S. D.	3.50	———	7.00	8.00	10.00	10.50	———	———	———	———	———	———	———
Denver, Colo.	———	———	———	11.80	———	———	———	———	———	———	———	———	———
Douglas, Ariz.	———	6.00	6.00	———	13.00	———	———	———	———	———	———	———	———
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	———	21.30	20.00	20.00	———	30.00
Garbutt, N. Y.	———	———	6.00	8.00	10.00	10.00	———	7.00	———	———	———	20.00	———
Grand Rapids, Mich.	3 00	———	5.00	10.00	10.00	10.00	———	———	31.00	———	19.75	20.00	30.00
Hanover, Mont.	4 50	———	6.00	10.00	———	10.50	———	———	———	———	———	———	———
Mound House, Nev.	———	8.50	6.50	10.50@11.50	———	———	———	———	———	———	———	———	———
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00*	30.75	21.00	19.37	20.00	30.00
Portland, Colo.	———	———	———	10.00	———	———	———	———	———	———	———	———	———
San Francisco, Calif.	———	———	———	16.40	———	———	———	———	———	———	———	———	———
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	———	———	———	———	28.50	———	35.00

NOTE—Returnable Bags, 10c each; Paper Bags, $1.50 per ton extra (not returnable).
*Sanded Wood Fiber $2.50 per ton additional.

News of All the Industry

Incorporations

U. S. Fibre Lath and Plasterboard Co., Chicago, increased stock from $10,000 to $50,000.

Webster County Quarry Co. has been incorporated in Marshfield, Mo., with a capital of $250,000.

Louisville Cement Co., of Louisville Ky., has increased its capital stock from $2,100,000 to $2,250,000.

Garfield Rock Asphalt Co., Frankfort, Ky., has been authorized to sell $150,000 preferred and $700,000 common stock.

Bluestone Sand and Gravel Co. has been incorporated in Seattle, Wash., with a capital of $100,000, by W. L. Beddow and W. R. Chesley.

Olean Sand and Gravel Corp., Olean, N. Y., 1500 shares preferred stock, $100 each; 1500 common, no par value; T. H. and P. H. Quinn, M. L. Barton.

South Ottawa Silica Co., 411 Central Life bldg., Ottawa, Ill.; silica and kindred products; $30,000. Incorporators: Thomas E. White, F. A. Cebulske and J. J. Schuneman.

F. M. Cassady received two carloads of machinery for his granite quarry six miles from Llano, Texas, last week. He has incorporated his new company for $50,000 and will start operation as soon as machinery is installed.

Windsor Cement Co., Inc., Windsor, Conn., president, Joseph C. Seguine; vice-president, Arthur A. Jackson; treasurer, Ralph H. Seguine; secretary, Walter S. Ray; they, with E. D. King, Alfred F. King and Fred B. Lawton, are the directors.

Lyell Avenue Sand and Gravel Co., of Coldwater, Monroe county, N. Y., to deal in cement, sand and gravel with a capital of 162 shares of no par value. The directors are J. L. Bonesteele of Coldwater, James Vincelli and George Reeners of Rochester.

Indiana Stone Products Co., Indianapolis, with a capital of $25,000, has been incorporated to operate quarries and crushed stone plants. The directors of the company are C. F. Kreis, G. H. Harris, C. A. Bates, M. G. Keene and W. C. Reinheimer.

Clear Creek Quarries Co., of Bloomington, Ind., has been incorporated with a capital of $200,000, to quarry and vend stone. The directors of the company are William Graham, C. E. Henderson, W. V. Pitts, William Kittles, Ernest Nigg, George Wettlaufer and E. H. Smith.

New Point Stone Co., New Point, Ind., has filed articles of incorporation with the secretary of state. The company has a capital of $30,000 and its directors are Myron Freeland, Carl E. Brown and Theodore Wanstrath. They will conduct a quarry and limestone crushing business.

Sand and Gravel

Independent Gravel Co., Joplin, Mo., has moved its office from 212½ West Fourth st. to the Spiva bldg., 222 West Fourth st.

Frank Van Hoosen has sold a half interest in the Corvallis Gravel Works, Corvallis, Ore., to Walter C. Galloway.

Lincoln Sand and Gravel Co., Lincoln, Ill., has ordered one 0-6-0 switching type locomotive from the Baldwin Locomotive Works.

George V. Nolte is reported to have succeeded to the entire business of the Whitby Island Sand and Gravel Co., in Bellingham, Wash.

Goold & Johns have rehabilitated the Bellota sand and gravel plant near Stockton, Calif., and will shortly put it to producing. The gravel is said to carry 12 cents per yd. in gold.

The council paving committee of Minneapolis, Minn., rejected all bids for supplying gravel and crushed rock for the 1924 paving program. The low bid was $1.50 a cu. yd., the same price as last year, but the committee believes lower bids will be possible if they are requested on condition that the contractors furnish the gravel or rock delivered on each separate block.

B. H. Pemier, state highway engineer, according to the Kirksville (Mo.) Express, was at Macon, Mo., attending the district meeting of the road engineers and contractors. He said the highway department had discovered a deposit of 1,000,000 tons of gravel in a cornfield near LaGrange, Mo., and that it would go a long way toward solving the cost of hard surfacing roads in north Missouri. He said this gravel did not cost over 5 cents a ton, and could be used on all roads in north Mo.

C. W. Stevens Gravel Co., Indianapolis, is contemplating the construction of two circular steel bins for the storing and loading of sand and gravel. With each bin having a capacity of about 150 yd. of sand or gravel, the daily output of the company will be increased to 700 or 800 yd., Mr. Stevens said. The bins, which the company are considering, are of a new design. They are cone-shaped, about 25 ft. high, with a diameter of 15 ft. and are made from ¼-in. sheet steel. Owing to the conical bottom there are no angles or corners to collect and hold back the material.

Quarries

Kensico Quarry Co. property, White Plains, N. Y., has been sold to William W. Bachman of White Plains.

J. L. Arlitt, Littlefield bldg., Austin, Texas, has acquired the holdings of the Opaline Granite Co. at Llano, Texas, and will develop.

France Stone and Building Co., Toledo, Ohio, has purchased a farm two miles from Findlay, Ohio, and will open a stone quarry thereon.

Dolese Brothers Crushed Stone Co., 2 West 14th street, Oklahoma City, Okla., is soon to begin the construction of a 36x55-ft. office building at 13th and Santa Fe streets.

Builders' Crushed Rock Co. has obtained 40 acres at Azusa, Calif., and will begin at once to construct a plant to supply crushed rock and gravel to the building and road construction trade of southern California. The new plant will have a capacity of 150 tons an hr.

Haydite Co., of Kansas City, has advised the chamber of commerce at Parsons, Kan., that its 14-day test on shale found on the Bolene farm near Parsons was suitable for the manufacture of Haydite products. The shale, it is understood, is to be purchased by the Kansas City company.

The North Kansas City News reports the completion of a deal in Liberty, Mo., whereby an organization of Kansas City, Chicago and Indianapolis men acquired 35 acres of land south of Smithville, from which rock for road construction is to be quarried. The purchase price was $500 an acre, an increase of $385 an acre over the price for which the same land sold four years ago.

Sparta Quarry, of Sparta, Ill., which recently opened a new quarry near Collins on the M.-I. railroad, has purchased a new crusher with a capacity of about 90 tons of rock per hr. The crusher was shipped last Saturday and will be installed as soon as it arrives. The quarry company has a contract for thousands of tons of rock for road work in this vicinity this year and the new crusher was necessary to fill the orders.

E. A. Schuster Construction Co., of Denmark, Wis., has been awarded a contract for about 7000 yd. of crushed stone. The crushed stone, together with the screenings which come from it, are to be used in the construction of the Neenah-Winchester concrete pavement. The stone is to be supplied from the Johnson farm on that road and crushed and hauled by the Schuster company. There were two bids, of which this was the lower, it being for $1.63 a cu. yd. for crushed stone and 62 cents for screenings.

Cement

Old Mission Cement Co. offices, now located in the Mills bldg., are being moved to new and larger quarters in the recently completed Standard Oil bldg. at Bush and Sansome streets, San Francisco.

International cement plant at Irvin, Idaho, has resumed operation and from 6 to 10 carloads of cement rock are now being handled daily on the Spokane International railroad from Bayview, Idaho, to the plant. The rock is quarried near Lakeview and transported to Bayview on barges.

Choctaw Portland Cement Co. was sold at auction at McAllister, Okla., for $199,000. G. M. Canterbury, trustee for five Tulsa banks, was the purchaser. The property is said to represent an investment of $1,500,000. Canterbury intimated the plant will either be rehabilitated and opened at Hartshorne or moved to Tulsa. Approximately $350,000 of the indebtedness against the plant was held by the purchasing banks.

Riverside Cement and Asbestos Manufacturing Co., of which Amos Jones, Los Angeles, Calif., is superintendent, is planning the erection of a 1000-bbl. cement mill at Eden Hot Springs, near the foot of the Jackrabbit trail. This company, with headquarters in Riverside, Calif., plans using the output of this cement plant and also of asbestos mines near Globe, Ariz., in the manufacture of shingles, tile, wall board, corrugated and flat lumber.

Gypsum

E. Lea Marsh has resigned as secretary of the United Gypsum Co., Chicago. He expects to reside in Sandusky, Ohio, shortly.

American Cement and Plaster Co.'s plant at Fort Dodge, Iowa, began construction on March 1. The building will be 400 ft. long and the contract price on the building is stated to be $60,000.

Rock Asphalt

Vernon Asphalt Co., operating near Bellamy, Mo., has received from the state the necessary authority to sell stock, having convinced the state authorities that it is not a blue sky proposition. The company estimates that $10,000 to $15,000 will be required to install a 250-ton plant and stock to that amount will be put upon the market. The idea of the company's board of directors seems to be not to sell more stock than necessary to start up in good shape.

Lime

Pacific Lime and Plaster Co. is branching out in the vicinity of Columbia, Calif., where the company has leased the property of F. S. May. A crew of men is at work breaking lime rock.

Sullivan Lime Quarry and plant at Sonora, Calif., has been purchased by W. McLaughlin of San Francisco. The plant has not been in operation for some time but plans are under way for a renewal of its activities.

Calcium Arsenate and Lime Co., has begun the building of its new plant at Waco, Texas. The excavation work is to cost around $2500, while around $150,000 is to be spent on the plant proper and the equipment. It is hoped to have the plant in operation by April 1.

Security Lime and Cement Co., of Hagerstown, Md., has recently increased its common capitalization from $800,000 to $1,200,000, and disbursed the additional stock among its shareholders in the shape of a 50% stock dividend. The stock dividend did not make up all the good things the management had in store for the shareholders for it paid them out of earnings realized last year dividends totaling 18% in cash. The company paid 6% on its common stock in 1922 or only one-third as much as it paid in 1923.

Warner-American Lime and Stone Co. employes, including the office force and superintendents from Bellefonte and vicinity, gathered at the Nittany Country club at Hecla Park recently to enjoy a banquet. The room was beautifully decorated in draperies and flowers and presented an appearance truly in accord with the ideals of the company. The guests were entertained by music from the Achenbach's orchestra of State College, and by radio which had been especially installed at the club that evening, the main feature of the program consisting of President Coolidge's address which was broadcasted from Schenectady, N. Y. Immediately following the banquet they were addressed by Charles Warner and others,who stressed the progress of the organization and the efficiency of the company as at present conducted.

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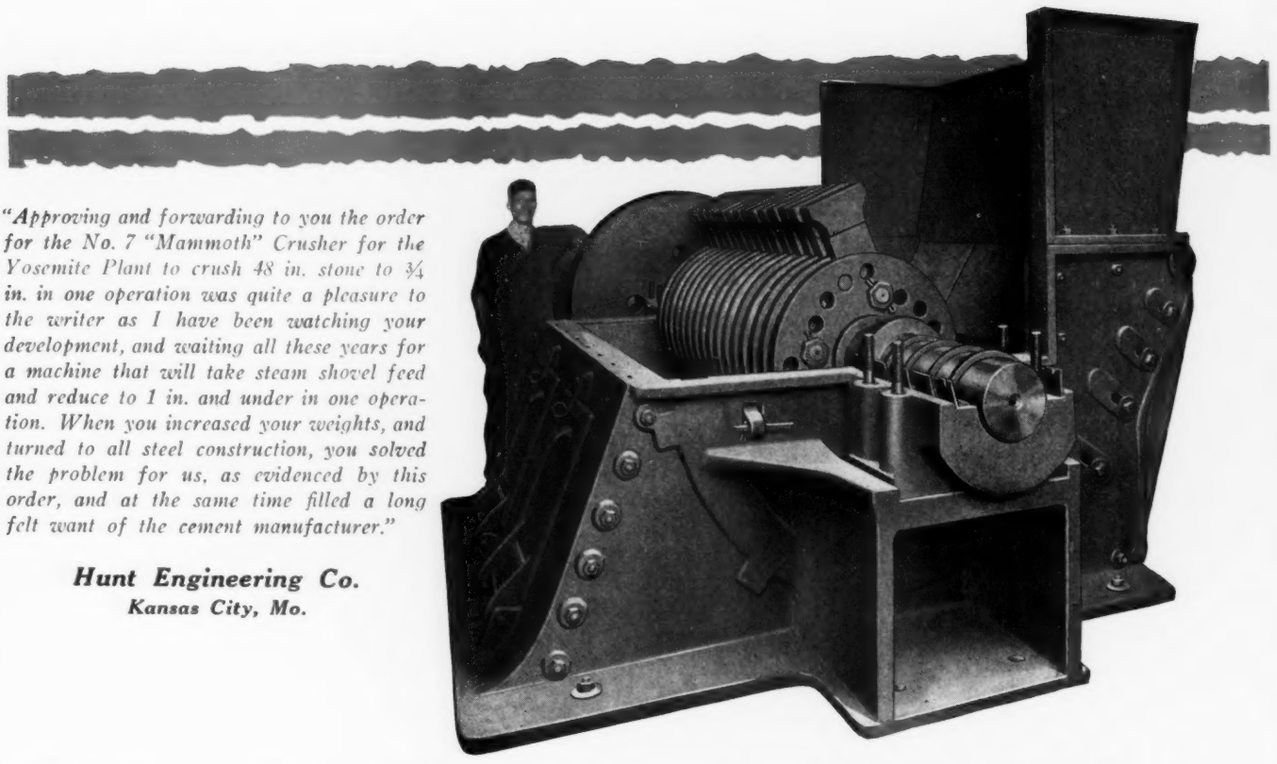

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